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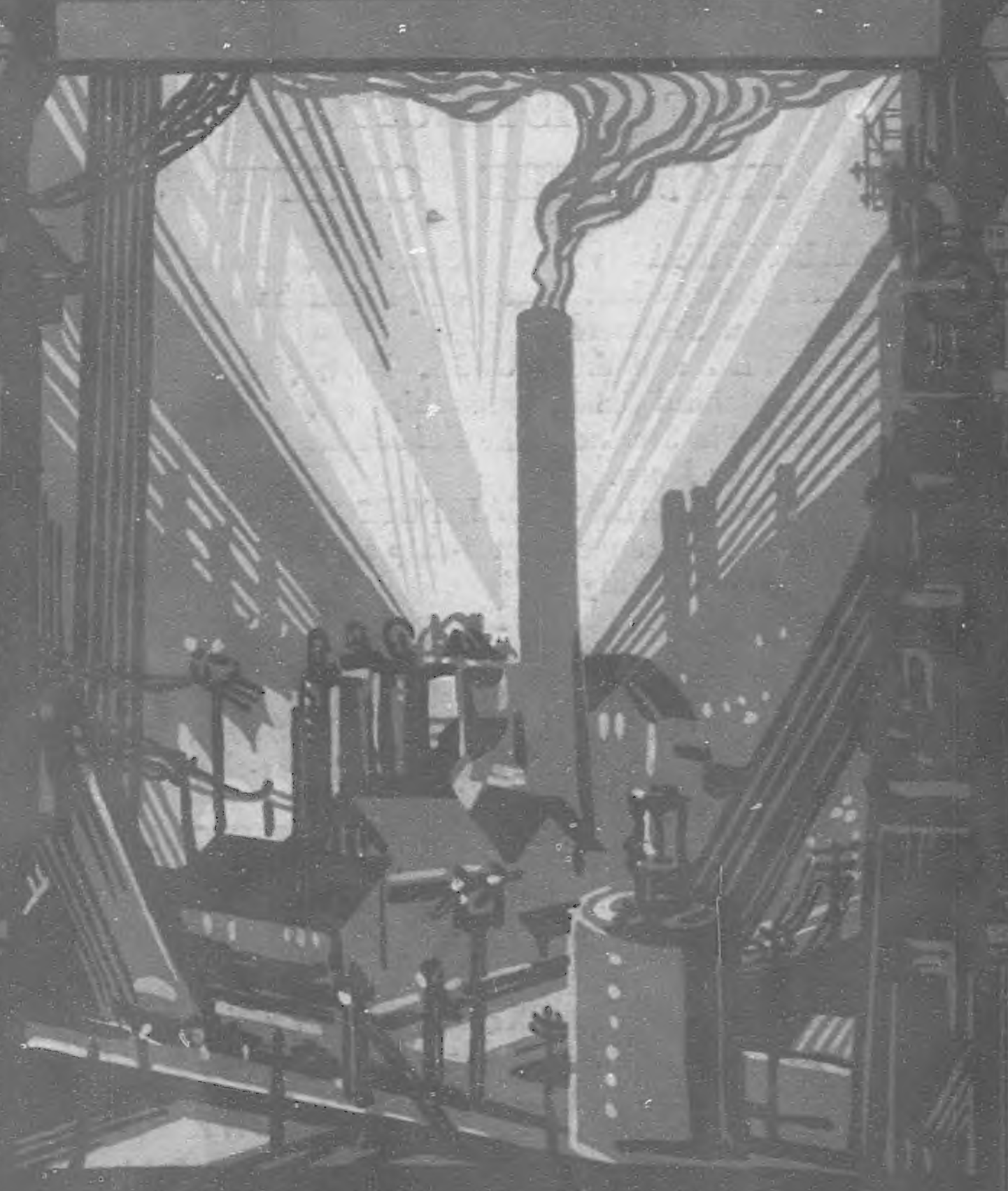

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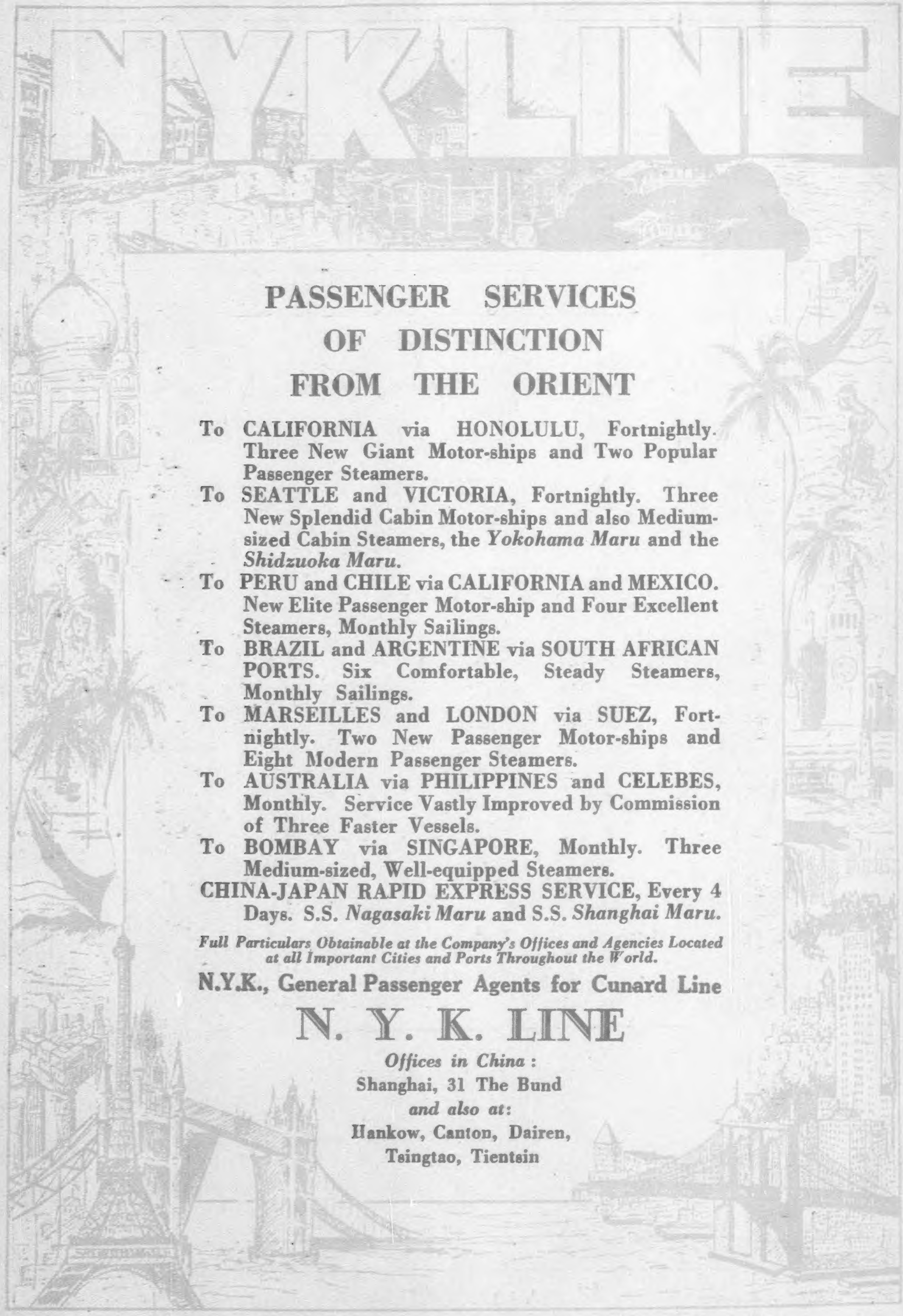

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

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Back to Moscow?

THE *New York Sun* of March 3, published a copyrighted interview with Judge Paul Linebarger, "*Legal Adviser to the National Government of China and its special treaty envoy to America,*" in which the spokesman for Nanking said: "*If the Chinese Government did not get a silver bullion loan from the United States, it would get it from Soviet Russia.*" "*The Chinese and Russians,*" *he added,* "*could team up together very nicely. They are Asiatics and they understand each other. They would make a great economic combination.*"

It seems that Judge Linebarger was in New York on the above date attending a Kuomintang convention at which he delivered one of his characteristic speeches. Left Wingers of the Kuomintang, maintaining a paper in New York called the *Nationalistic Daily*, have been trying to hamstring the movement for a huge silver loan to China, and a large part of Judge Linebarger's address was devoted to denouncing their campaign. "*You must drive all the Chinese Reds out of America,*" *he said.* "*When they get back to China, we know what to do with them. If they don't stop making trouble, I intend to have them deported myself.*"

Questioned later about the incongruity between an alliance with Russia and his denunciation of communism, Judge Linebarger said, "*The Russians aren't just wild men running around killing each other.*" "*They have a stable government and we* (meaning the Chinese) *can do business with them, but that doesn't mean that we have to accept their doctrines.* "*We'll make a deal with them within a year, if we don't get what we want at Washington.*"

We know that Judge Linebarger is the Legal Adviser of the National Government but we did not know until we read it in the New York newspapers that he is also a "*special treaty envoy to America,*" which would indicate that he also holds credentials from the Ministry of Foreign Affairs. This considerably strengthens his position and powers to speak with full authority for the government he represents. When he lays down the ultimatum that if money is not forthcoming from the United States, Nanking will get it from Moscow, the inference is that the matter was fully discussed and a decision arrived at by the responsible government officials at Nanking prior to his departure.

The Minister of Finance of the National Government of China issued last month his annual budget report and in it makes very clear his attitude and policy in regard to the restoration of China's credit before seeking outside financial assistance in any form. He says that China is not seeking a foreign loan at this time. The Chairman of the Chinese Bankers' Association also stated that his group has sufficient funds to finance all the reconstruction requirements of the government as soon as conditions are again normal. Judge Linebarger, the "special treaty envoy of the National Government," declares in no uncertain words, that if the American Government or Bankers do not lend China a billion dollars *pronto*, that is, immediately, if not sooner, "his government" will get the money from Moscow!

Now, the only justification for a huge unsecured foreign loan to China at this moment, is to enable Nanking to suppress and rid the country of the communist and bandit armies that constitute the gravest danger to organized and stable government. The sympathy and support of the leading foreign Powers to Generalissimo Chiang Kai-shek and the Right Wing of the Kuomintang Party since they split with Wuchang and created the present National Government, is traceable primarily to their desire to strengthen Nanking in its struggle to free the country from the Communist menace. That Nanking was able to set up as an independent government and overthrow the Soviet-led Wuchang group was due largely to the financial support extended to General Chiang Kai-shek by well-known foreign interests in Shanghai, who realized that unless this support was forthcoming at that moment, the Soviet would triumph in China.

The "imperialistic and capitalistic Powers" have continued to support Nanking by conceding practically every request that would help the new government maintain itself in power by its own revenues. Minister Soong's budget figures and report on the finances of the country, bears eloquent evidence to this spirit of sympathetic foreign co-operation, revealing that had it not been for the tariff autonomy treaties and foreign submission to other taxation, Nanking could never have raised the funds to support its armies and preserve its authority. It was impossible from a practical political or business point of view to directly strengthen Nanking with foreign loans to carry out unproductive military campaigns, so the support of the friendly Powers had to take some other form. It was given freely in the treaties and other concessions which enabled Nanking to increase its import revenues in two years from $72,000,000 to $211,000.000.

But this is not enough. The needs of Nanking increase. The demands of its armies must be met. They cannot be reduced without handing the country over to anarchy. Communist armies and bandit hordes still defy and endanger the stability of the Government and constitute a menace to foreign lives, property and trade. Once again, tariffs must be raised. New taxation, extending to all foreign firms, is to be imposed in order to cover the deficit in the national budget and permit Nanking to discharge its international obligations without recourse to foreign loans. There is no complaint from the foreigners. They realize that unless Nanking is supported, it is only a question of time when the Communists will overrun the country.

It is still difficult and impracticable for foreign bankers to extend financial assistance to Nanking as a straight business proposition; it is not easy for the Government of the United States either alone or in combination with other nations, to extend financial assistance direct from their treasuries to Nanking in order to further strengthen its resistance to forces determined on the destruction of the country. But they can make no objection to any reasonable or legitimate raising of revenues from within, even if it bears hard on their trade or investments. It is all they can do under the circumstances to continue to support and express their confidence in Nanking. It is all that can be done under the circumstances from without to bolster up some one group, party, or faction and enable it to discharge the rudimentary obligations of government, maintain the continuity of foreign diplomatic intercourse and accept responsibility for the protection of foreign lives and properties and the fulfilment of treaties. International law has been stretched very thin in order to preserve the fiction of a united China under a government still struggling to assert its authority. The test of a government's stability is its ability to exercise jurisdiction within its territorial boundaries. Failure to discharge these basic functions, has in many instances resulted in some other Power taking over the obligation. China lost her sovereignty over Formosa because the old Manchu government could not control the savages of the southern end of the island.

Failure to exercise jurisdiction over outlying areas now embraced within territory over which Nanking claims sovereignty, might well precipitate some incident which would justify other Powers in taking steps to protect their interests in these areas. Recognition of any government carries with it certain obligations that must be faithfully discharged. Continued recognition by the Powers of the Kuomintang dictatorship in contravention of all accepted theories and practice of international law, can be explained solely by the fact that the outside would is tired of these protracted civil wars in China and will gladly recognize and support any faction that holds out some hope of establishing its rule over the whole country. When, in addition, the program and policy of that faction (which obtained for it prompt recognition by the Powers) is to purge the country of communism, we can understand why Nanking has received such whole-hearted support and sympathy.

To be told at this late date that unless we further assist Nanking with an unsecured loan of a billion ounces of silver, that the National Government will make a deal with Moscow, is, to say the least, disquieting. On two former occasions, China entered into an alliance or understanding with Russia and brought upon herself most of the impairments of her sovereignty she is now trying desperately to free herself from. China can repeat the mistake. She is mistress of her own destiny. It is her own affair. Other Powers, however, would be compelled to take the necessary measures to protect themselves and it is entirely within the realms of possibility that their first step would be to withdraw recognition from Nanking and support some other faction.

At a time when negotiations affecting the status of all foreigners in China are nearing a deadlock, with uncertainty and anxiety prevailing as to what may happen after May 1; with incidents occurring in all parts of the country that might easily provoke a crisis; it is the height of insanity for a high official of the Chinese Government to announce or even intimate that unless we unconditionally pour a billion dollars in silver into China, Nanking will make a deal with Moscow within the year.

The Chinese complain that they are misrepresented by foreign newspaper correspondents; that they need their own international publicity organization to present their case fairly before the world. We venture to state that if any foreign newspaper in China should even insinuate that Nanking intended to make a deal with Moscow, it would be barred from the mails and otherwise penalized for spreading malicious falsehoods about the National Government. Yet here we have a responsible high official and treaty envoy of that same Government announcing in the United States that such a deal may eventuate during the year unless we come across with the coin.

We have given more space to Judge Linebarger's statement than it really deserves, not because it is of any great importance but to emphasize the woeful lack of cohesion and co-ordination in matters of vital national policy at Nanking at a time when team work is essential. The special treaty envoy is adding to the burdens that Dr. C. T. Wang has to bear, making his task more difficult. If what the Legal Adviser to the National Government says is true, this is no time for the Powers to discuss further the immediate and unconditional surrender of their extraterritoriality privileges. The Minister of Finance is engaged on a tremendous uphill job to restore China's credit. Judge Linebarger's statement will not inspire confidence in his program. If his statement is not true, it is squarely up to Nanking to exercise a censorship over its special envoy before his oratorical disclosures give rise to justifiable suspicions of its good-faith and future policies.

G. B. R.

Chinese Official Publicity

In an address at a conference on journalism held recently at Yengching University at Peiping, Mr. Edward Bing-Shuey Lee, Editor of the *Peking Leader* stressing China's need of her own form of international publicity, stated that "it was due to a great extent to organized publicity that the Nationalists succeeded so admirably in the Northern expedition when they started out from Canton only a few years ago, for paper bullets in the form of pamphlets and slogans proved more formidable than lead bullets."

Commenting on Mr. Lee's talk, the *Peking and Tientsin Press*, remarks:

"The trouble is not with the correspondents. It is with the news. The correspondents in China are the same sort of men as represent the same agencies and papers in other capitals. They can no more change their spots than can the leopard. They are all alike in their eagerness for a good story, and for the most part they are wholly objective. But compare the despatches from Tokyo or London or Berlin with those from China and a considerable difference is immediately evident. And the difference lies not in the correspondent but in the field.... When China gets down to solid work and begins to make a real success of the Revolution she will have no need of any official propagandist organs. If we know anything about our colleagues in the profession, they must be pretty sick of the sort of story they have to send Home ..... But while China is a center of chaos instead of a great creative workshop she must expect to get a bad Press. News cannot be invented more than once in an unscrupulous while. If China provides the good news, the correspondents will let the world hear about it. That is their job, and it would be a far more pleasant one than cabling about the murder of foreign women, kidnapping of missionaries, civil wars, political *coups d'etat*, and the other phenomena representing the 'news' in this country to-day."

That is true. The trouble with China and the news goes back to the very publicity campaign that Mr. Lee cites in the opening words of his talk to support his argument. Had the National propaganda been confined to China, it would be a different story, but it was spread all over the world, not only by Chinese, but by well-known Communist agencies. The American press accepted the Nationalist movement as a real urge of the Chinese people towards democracy. Those who tried to counteract the Soviet campaign to use China as the springboard for a world revolution, were denounced as imperialists, die-hards and even worse. The campaign to capture American opinion was most audacious and unscrupulous. Paid propagandists swarmed over the country, monopolizing the public forums and filling the newspapers with eulogies of the Nationalist movement. Chinese students in America printed and circulated communist publications direct from universities and bombarded the President of the United States and the Secretary of State with demands for immediate recognition of the new Government. Then came the Nanking Incident, and the further developments leading to the elimination of Borodin and the establishment of a real Chinese National Government, which tore away the veil of secrecy and exposed the inside working of a revolutionary movement directed by Moscow. The subsequent attempts of Nanking to suppress the truth, deport reputable correspondents and impose its own viewpoint, led to a thorough investigation of American newspaper activities and connections in China, with the result that it is now practically impossible for any Chinese official publicity campaign to succeed in the United States.

The American people are not particularly interested in Chinese politics, but they do want to know the truth about what is happening towards unification and pacification as the first step towards financial and industrial rehabilitation. Experience has taught Americans that they cannot rely on foreign official news services to present the news free from some taint of propaganda and our editors are now determined to collect this information at its source through their own correspondents. China might spend millions upon international publicity, but unless it is based on truth and accomplishment it will be money wasted. As our Tientsin contemporary points out; "official propaganda is no cure for China's lowered prestige." No nation can pull itself up by its boot straps.

China needs no paid propaganda agents, official news bureaux or press associations for the dissemination of international publicity. The trouble with Chinese journalists is that in their great majority they are politicians first and anybody who holds opposite views or arrives at different conclusions based on the facts, is either a "paid propagandist" or guilty of deliberate misrepresentation. China expects her side of the case to be accepted without question. A foreign editor may sympathize with ninety nine percent of their problems, but if he holds opposing views on the other one percent he is "unfriendly," if not an enemy.

There are certain facts concerning China which cannot be concealed. When these have to do with international relations. China must expect that the other nations will find some way to obtain publicity for their side of the case.

Another Step Forward

ANOTHER step towards unification and central control is being made by the creation of a National Economic Planning Commission for the co-ordination of the constructive activities of the various central and local government organs. It has long been apparent that no real progress could be made in national reconstruction until all the grandiose schemes involving in the aggregate an expenditure of billions of dollars were co-ordinated with the national budget after receiving the approval of the Ministry responsible for finding the funds.

In the past it has too often been the case that a minister or high official has obtained his appointment solely to put through some pet scheme involving the raising of a loan for its execution. If successful, that was the end of his official career. He got his slice of the proceeds, filled the jobs with his family and protégés and retired. While there is no evidence that this old system is being perpetuated by the new government, yet, there are signs that its influence is not altogether eradicated. Each Ministry, bureau and commission works in a watertight compartment, drawing up plans for various construction schemes that even if it were possible to finance them, would absorb all the capital available for years to come in the lending nations of the world.

The urgent need for some such co-ordinating commission is seen in the activities of the Legal Adviser to the National Government, who in order to assure the success of his own pet scheme, is willing to hamstring the efforts of the Minister of Finance in his program to restore confidence in the nation's credit abroad.

We may hold a legitimate difference of opinion in regard to the political activities of the Ministry of Foreign Affairs in matters which affect the status of foreigners until such time as the government is able to discharge its treaty obligations, but we have only the highest praise for the constructive program of the other ministries. China is making progress. All along the line there is evidence of a new spirit of constructive enthusiasm, and in those areas free from communism and the onerous burdens of maintaining huge armies, the wonderful recuperative powers of the people are being demonstrated by new public works and improvements that make for real progress. Another year of peace and China will be well along the road towards ultimate prosperity.

Her needs are vast, the opportunities for graft and corruption are many. The new régime cannot overthrow the customs and traditions of the people in a few years, but it can exercise a supervisory control over all construction schemes that are financed either in whole or in part by the central treasury. The new Economic Planning Commission is a step towards co-ordination and the implanting of efficiency and honesty in governmental contracts.

The imperative need for the organization of some such planning organization has already been stressed by Minister Soong in his annual financial report submitted to the Central Political Council last month.

"Reflecting the widening requirements of the public," Minister Soong wrote, "We have seen each department of the Government pursuing its own pet projects, all of them involving huge expenditure. Doubtless many of these projects are, in themselves, sound but they must be unrealizable because of the known lack of funds and the fact that they are not co-ordinated with the project of other departments."

After referring to the Soviet Supreme Economic Council as the outstanding example of deliberate state planning, Mr. Soong continued: "Surely a case has been made for discarding the haphazard, unrelated and clashing programs of the various branches of the Government, and the creation of a really effective planning organization, which would guide the productive forces of the country, co-ordinate the activities of the various ministries, and rigidly map out the essential ends which, for a given course of years, each of the different components is obliged to pursue. With such co-ordinated and purposeful activity within the Government, whereby it is made a unified and effective instrument to serve the nation, the financial resources available within the country itself for constructive development will prove to be greater than is ordinarily realized."

According to the draft regulations now under the consideration of the Legislative Yuan, the duty of the Economic Planning Commission will be to formulate comprehensive economic projects in the light of the existing financial and economic conditions of the country, as well as to co-ordinate the economic and productive activities of the various ministries and commissions of the Central Government and the various local governments (*i.e.*, provincial and municipal governments).

The Commission is to be under the direct jurisdiction of the Executive Yuan. All economic, industrial or other constructive projects involving the expenditure of national funds, whether sponsored by central or local government organs, must be first submitted to the Economic Planning Commission for examination and approval before steps can be taken for their realization.

In the carrying out of various economic constructive projects, the Commission will have power to investigate into the work as well as the expenditure involved.

Chinese Government Steel Plant and National Defence

THE new Ministry of Industry at Nanking has submitted a long memorandum to the National Government outlining a plan for the establishment of a 150,000 ton steel plant at Pukow to cost $82,000,000. Although the plant is a small one and can hardly hope to liberate China from dependence upon foreign sources for her steel requirements, it will materially strengthen the National Government by supplying its own immediate needs.

Any project for the erection of a new steel plant in China invites attention to the experience of the Han Yeh Ping properties and their once splendid opportunity to supply the national demand for steel and steel products. The steel situation in China was briefly reviewed in the March (1931) issue of *The Far Eastern Review*, from data submitted to the Government by the Reconstruction Commission. Referring to the Han Yeh Ping company, the report says:

"Although this plant has been closed down during the last few years it is the largest and best equipped iron and steel works in the country. The National Construction Commission has made an investigation of its coal and iron mines as well as the iron and steel plant. A scheme to put these works into good working condition, costing about four million dollars is under consideration.

"The works have been losing money ever since they started. The following table shows their financial condition:

1909	$ 15,400.53	profit	1917	$2,801,872.20	profit
1910	64,151.71	,,	1918	3,779,904.47	,,
1911	2,301,500.85	loss	1919	2,918,463.63	,,
1912	2,872,075.52	,,	1920	1,279,588.44	loss
1913	1,538,389.82	,,	1921	511,835.03	,,
1914	100,967.97	,,	1922	3,666,876.36	,,
1915	388,105.93	,,	1923	2,952,609.86	,,
1916	1,878,496.83	profit			

"Not only has the company lost money but it has incurred a big debt, which probably can never be paid back. Debts amounting to Y.50,000,000 are owed to Japanese financiers and another Tls. 2,500,000 to native banks, while, the present value of the properties is estimated at Tls. 22,030,000."

The feature of the report is the fact that the company has borrowed over Y.50,000,000 from Japanese financiers while the present value of the properties is estimated at Tls. 22,000,000; which, at the present rate of exchange, would indicate that the Japanese have loaned the company an amount exceeding three times its actual value. Obviously, this huge loan may never be

repaid, nor can the Japanese lenders exercise the right of foreclosure, take over the properties and operate them, in order to get their money back. The one hope that the Han Yeh Ping might at some time in the future become a profitable enterprise, consists in its ability to supply the government with its requirements. Take this market away, by the establishment of a new government owned plant and the Han Yeh Ping steel mill is finished as a commercial enterprise.

Here again, we encounter a problem very similar to the one involved in the erection of a Radio Station at Shanghai where any solution of the tangle is possible only by ignoring all previous agreements and building an entirely new plant at the government's expense. The Nanking Government feels that it must have a steel plant that it can rely upon to furnish at least its war requirements. At present, although China possesses the largest army in the world, and is building up a respectable navy, it is absolutely dependent upon outside sources for its war material. Under such conditions, the army is helpless. In the event of a showdown with Russia, the Chinese forces could not carry on for over a month, without outside help, while if China should ever precipitate an issue with Japan, not even these outside sources could be relied upon to carry her through. A Japanese blockade of China's ports would effectively put a stop to any importations of arms or war munitions.

Chinese editors overlook this essential requisite to efficiency when they say :—

"China owes her present position of independence, or near-independence in the family of nations, largely to the National Army. The National Army, plus the nationalistic spirit which is largely a product of the army, have enabled China to reach her present position in the family of nations. To expect China to scrap this army because some of China's neighbors disapprove of it, is asking the impossible."

China's army, no matter how large, how patriotic, how valiant, could wage a war without munitions, and as long as China's present dependence on outside sources for her steel and munitions requirements continues, it makes little difference whether the army is scrapped, or enlarged. It's efficiency and ability to prosecute a real war, can be gauged to a nicety by any military observer. To say that China owes her present position of independence or near-independence in the family of nations, to the possession of her army, is the most ridiculous statement that has so far emanated from Nanking's publicity organization.

China can never be strong, until she is more or less self-sufficient in equipping her forces with the basic requisite for all modern warfare.

If the Han Yeh Ping steel mill cannot be reopened and operated as a government enterprise, Nanking's solution to her steel problem is to erect a plant of its own, in territory adjacent to the capital where it can be properly defended.

Proposed Steel Plant for China

It is learned from authentic sources that the Ministry of Industry has submitted a long memorandum to the National Government outlining a plan for the establishment of a great steel plant at Pukow. The cost of the plant is estimated at $82,040,000.

"The production of iron and steel," says the Ministry's memorandum on the subject, "is of essential importance to the development of China's industries, and is an important factor in the development of the country's communications. China's annual iron and steel imports total from 500,000 to 600,000 tons. With the reconstruction projects of China still to be started, take the railway alone, the necessity of China having its own iron and steel plants is only too evident. With the exception of the plants in the Three Eastern Provinces, the iron and steel plants in China have been shut down owing to various difficulties. To develop this industry, the National Government must take an active rôle.

Plants Shut Down

"The Yangtze Valley holds an important place in China's industrial and communication enterprises. The former plants had an annual output of 500,000 tons, but these were all shut down. Although these plants can be operated again, their steel production capacity is too limited to meet the growing need in this country. When the products of these plants are exported to foreign markets, they cannot compete with the products of foreign plants. In order to facilitate the development of industries in China and to supply the necessary materials for the reconstruction of the Capital, it is proposed that a steel plant be established at Pukow, across the river from Nanking.

"According to investigations conducted by experts of the Ministry, iron ore reserves in the lower Yangtze Valley total 80,000,000 tons. The iron ore reserves at Feng Yuan Hill, near Nanking, are estimated to be about 4,000,000 tons. There are about 8,000,000 tons of iron ore reserves in Anhui Province. Resources of iron ores in Tung Shan, Kiangsu Province, and Kiukiang, Kiangsi Province, total 4,000,000 tons. The resources at Tayeh and Ou-chen, both cities in Hupeh Province, total 20,000,000 tons.

Supply for 100 Years

"The deposits which have a percentage higher than 50% and have good transportation facilities, total about 32,000,000 tons. If 1,000 tons of ore are smelted daily, with a daily output of 500 tons of iron, the deposits in the Yangtze Valley mines are sufficient for the needs of at least 100 years.

"The chief difficulty of iron works in China is to obtain good coal from a reasonable distance. The supply of coal largely comes from Tsing Hsin, Tze Hsien and Lu Ho Kou mines which are all located along the Peiping-Hankow Railway. These mines are 2,000 li from the Capital. It is comparatively easier to obtain coal from Kai Lan and Po Shan mines. According to results of recent investigations, however, it is now possible to obtain good coal from Su Hsien, Anhui Province, and Hsuchowfu, Kiangsu Province. It is estimated that three tons of coal are required for the smelting of one ton of iron ore. About 100,000,000 tons of coal, therefore, are necessary for the smelting of iron ores totalling 30,000,000 tons.

Pukow may be Site

"It is proposed that the steel plant be established at Pukow. Pukow is a communication center, being connected with various industrial centers by rail and water. The pig iron and iron ores from up river can be transported to Pukow by water at a comparatively low cost. Such pig iron and iron ores were generally exported to foreign countries, especially Japan. In future they can be smelted at Pukow.

"The Lieh Shan mines at Su Hsien, Anhui Province, are 75 li from Su Hsien and about 45 li from Fu Li Chi, a station on the Tientsin-Pukow Railway. Preparations are being made to build a branch line from Fu Li Chi to the mines. The Feng Huan Shan mines are 60 li south of Nanking. A 13 mile branch railway will connect the mines with the Yangtze River.

Three Year Program

"It is planned to complete the entire program within three years. The daily steel production capacity of the plant is fixed at 600 tons. A supply of 1,200 tons of coal daily is needed. The Su Hsien mines alone can supply 2,300 tons of coal daily.

"The capital needed for the project is estimated to be as follows :

$2,000,000 for coal mines with an annual output of 700,000 tons.

$1,000,000 for the construction of a branch line connecting Su Hsien mines with the Tientsin-Pukow Railway.

$60,000,000 (£3,000,000) for a steel plant with an annual output of 150,000 tons of steel.

$10,000,000 (£500,000) for a furnace with a daily output of 500 tons of pig iron.

"The total cost of the project is estimated, therefore, to total approximately £4,102,000, or $82,040,000.

Can Sell Surplus

"It is estimated that the annual profit of the project will be $8,100,000. Apart from the coal used by the plant, the surplus of 600 tons of coal can be sold daily. If the average net profit is $3 per ton, the annual profit from these sales alone will total $540,000.

"The steel production of the plant will be about 150,000 tons a year. If the steel is valued at present market prices at Shanghai, or $160 per ton, the net profit will be $40 per ton. The annual profit is estimated at $6,000,000.

"The by-products of the plants are estimated to produce a net profit of about $5,200 daily, or a total of $1,560,000 a year."—(*Reuters*).

The Wings of the Rising Sun

THE General Staff of every first class Power must have a convenient enemy to justify its plans for national defence and security. Peace, arbitration and disarmament pacts may reduce the possibilities of war, but as soon as a limitation is agreed upon as to any particular type of armament, the nations concentrate their energies upon developing weapons not included in the pact. We limited the number of battle-ships and battle-cruisers and then started on a race for supremacy in light cruisers and submarines. We reached another agreement to regulate this new disparity in armaments and the signatory Powers are now vieing with each other for supremacy in the air. When the time arrives to call another international conference for aerial disarmament, the inventive genius of man will have developed an automatic radio directed flying boat and other mechanical devices that will again revolutionize the art of wholesale human slaughter, until the day will arrive when the peoples of the world will rise up in their wrath and demand a cessation of all further activities designed for their destruction.

In the meanwhile, the race for control of the ether is on, with the General Staffs of all the Powers setting up hypothetical enemies in order to have their estimates for national defence approved and incorporated into the budget. Now that the 5-5-3 naval ratio has been agreed upon, the fight for armaments centers upon the increase of air fleets. No longer do American jingoes and preparedness advocates harp on the certainty that a Japanese army will land on the Pacific Coast and devastate the country west of the Rockies. They now tell us how easy it will be for the Japanese air squadrons to bomb the coast cities or blow up the Panama Canal and fly back to their base on some Japanese aircraft carrier or submarine awaiting their return out in the Pacific.

Ten years ago, Japan viewed with deep concern and alarm the huge program for American naval expansion, entertaining no illusions as to the hypothetical enemy it was to be used against. Her own formidable naval program was frankly based on the contingency of a war with the United States, which was being brought nearer by the propaganda of other interested powers. The peace of the Pacific was assured at the Washingtom Conference and Japan was able to cut down her naval program, reduce her expenses and concentrate her activities on solving her basic food and population problems. America's immense industrial facilities, coupled with her initiative, inventive genius and a determination to lead the world in aviation, raised anew the struggle for the mastery of the Pacific. American military writers again saw in Japan the future enemy, whose air forces would become the menace to national security and the Japanese General Staff reacted in the same old way in order to support its own program for national defence.

It is characteristic of Japan that she followed the same methods in building up her air forces that has elevated her to the front ranks in shipbuilding and other engineering industries. Her scientists and technicians went abroad to study aviation and the manufacture of aircraft and motors. Although she was building up her industrial system along American lines and largely with American machinery, co-operating with Americans in every way for the advancement of their trade in the Far East, the requirements of her national defence closed to our manufacturers any intimate association in the design or building of their air armaments. The Japanese war bogey, lost for American manufacturers the most valuable aircraft market in Asia and is building up an industry on this side of the world that in due time, will become a vigorous competitor in markets we hope to conquer.

The Japanese have invited French and British air missions to teach them how to fly, to organize their air forces, lay out landing fields and instruct their army and navy in aerial warfare. The Japanese have acquired the patent rights of many of the foremost European aircraft manufacturers and have engaged the services of several of their best technical experts. Japan has made many mistakes, but she is willing to pay for them in order to master the new art in the same way that she has mastered our other engineering secrets. Japan cannot as yet boast of having contributed any spectacular achievement to the progress of aviation, but she is hammering away, making progress step by step and freeing herself gradually from dependence upon outside nations for her aerial requirements.

There are several aircraft factories in Japan equipped with the most modern appliances, technically capable of turning out equipment equal to any manufactured abroad. The Mitsubishi, Nakajima, Kawanishi, Kawasaki, Ishikawajima, and the Aichi Works are splendid examples of commercial aircraft factories, while several of the Japanese navy yards and army arsenals are equally well equipped to supply the air needs of their respective arms of the service. These companies are at present manufacturing under licences from European patentees, turning out planes and equipment equal in every respect to those made abroad. It is only necessary to state that the Kawasaki Dockyard holds the rights for constructing the Dornier machines; the Nakajima Works have hooked up with Fokker; the Kawanishi with Short Brothers, Ltd., and Mitsubishi with Junkers. An intense rivalry prevails amongst all the Japanese manufacturers to produce an entirely new all-Japanese plane and motor that will free the nation from paying royalties to foreign makers.

The T.G.E. (Tokyo Gas Electrical Industrial Co.) has produced a 150 h.p. motor entirely Japanese in design, material and workmanship and it has been adopted by the government for its armed forces. These progressive Japanese firms are not content to trail along behind the rest of the world turning out standard types and sizes of planes and motors. The great Mitsubishi interests have built and tested a 1,000 h.p. motor which is to be presented to the navy; the Kawasaki Works is planning to build a Dornier type boat superior to the Do-X and the Kawanishi Works are building a duplicate of the new Short Brothers big seaplane recently delivered for the navy. All along the line, the Japanese are showing the same spirit of initiative, adaptability and enterprise in the building of aircraft that has freed them from dependence upon other nations in all other lines of engineering.

Four years ago, Col. W. Jefferson Davis, an American army officer, wrote a book entitled "Japan, The Air Menace of the Pacific," which was remarkable for its dearth of real information to support his thesis but rich in good sound preparedness arguments to set Americans thinking about their own air future. At that time, Japan was a long way from being a menace to any other nation in the air. She could not even adequately defend herself against attack. The picture has not materially changed. Japan may now possess an efficient air force for the defence of her home territory or for use in any war whose theater will be confined to the Orient, but to speak of her an an air menace to the United States is as absurd as to put it the other way and make the United States a menace to Japan.

Japan, undoubtedly, is making every effort to hold her own in the new race for preparedness and if her general staff has to conjure up a hypothetical enemy in order to extract the necessary appropriations from a reluctant Diet, it does not have to go across the Pacific for that purpose. The real menace to the peace of the Far East remains exactly where it has always been, and when American jingoes recognize this fact, there may be a chance for our manufacturers of aircraft to find a market for their products in that country.—G. B. R.

Edgar Allen Engineering Catalogs:

This company has issued new editions of two of their Engineering Department's catalogs. The first deals with Double-Shell Rotary Dryers, and covers details of construction, representative thermal efficiency tests, information required for enquiries, and particulars of auxiliary equipment. The catalog is amply illustrated with photographs and diagrams, and should be in the possession of every engineer interested in the drying of materials.

The second pamphlet deals with Stag Pulverizing-Cylinders or intermittent ball-mills, used for grinding in a dry or wet state, materials such as colors, chemicals, ores, sand, quartz, etc. The catalog, in addition to giving full details of the various machines, discusses grinding media, and contains useful data such as particulars of standard laboratory screens, weights of various materials, and auxiliary plant.

Special features of both catalogs are the illustrations, many of which are of the character of reproduced blue prints.

China's Reconstruction

An Address by Mr. K. C. LI, before the Foreign Policy Association, New York, February 14, 1931

The reconstruction of China can be discussed in three distinct parts :

First, reconstruction by the Chinese people ;
Second, reconstruction by the Chinese government ; and
Third, reconstruction by international co-operation.

First : A program of reconstruction has been carried on very vigorously by the Chinese people in recent years, in spite of the difficulties caused by civil wars and Communist activities. For instance, since the Good Road movement started, motor roads have increased 900 per cent in less than nine years. According to the American Trade Commission at Shanghai, the total mileage open to motor traffic was 35,000 miles at the end of 1929, against 18,000 miles in May, 1928, an increase of almost 100 per cent in less than one and a half years.

There were only a few modern banks at the time of the Revolution in 1911, but at the end of 1930 there were 218 modern banking institutions. Foreign trade at the beginning of 1923 was 1,675,000,000 taels, and at the end of 1929 it was 2,281,000,000 taels, an increase of 605,000,000 taels, or 37 per cent in less than six years.

Other constructive work, such as public utilities, textile mills, chemical plants, flour mills, schools, colleges, mass educational movement, has increased from 150 per cent to 1,000 per cent within the last fifteen years.

Therefore, ladies and gentlemen, it is unfair to think of China only as a land of civil wars, filled with bandits, Communists and famine-stricken people. Such is true of some places in China—even in Chicago or in New York. (Laughter). In this connection, I would like to quote a circular letter dated January 2, 1931, by a distinguished American citizen, Dr. A. L. Warnshuis, now traveling in China, to all the secretaries of the Foreign Mission Boards of the United States and Canada, as follows :

" We lived in South Fukien from 1900 to 1915. We spent a week there in April, 1921, and now we have spent ten days in December, 1930, in Amoy.

" Instead of the dirty, dark, narrow and crooked streets in old Amoy, there are now straight streets, fifty and sixty feet wide, lighted by electricity.

" In the hills back of Amoy, a great dam has been built and a fresh water lake has been formed, from which pure water is piped to all parts of the city.

" The old shops and houses were low and dark and dingy, but now almost the whole city has been rebuilt with ferro-concrete buildings of three and four and five stories.

" What were formerly some of the dirtiest parts of the city have now been transformed into a fine public park with flowers and trees, tea gardens, tennis courts, race track, and a football field.

" New Amoy is a modern city and in contact with all the modern world."

Ladies and gentlemen, this letter is very significant, as Amoy was mentioned in the Encyclopedia Britannica, rightly or wrongly, as the dirtiest city in the world. Other cities, such as Canton, Hankow, Hangchow, Wuchow, Changsha, are equally progressive. If such progress was made in such trying times, what greater progress would there not be when political stability, order and peace prevail ? And there is every reason to believe that they will prevail in the nearest future.

Second : The reconstruction of China by government is impossible without economic rehabilitation. Economic rehabilitation of the nation is not possible without political rehabilitation ; and for that we need a good and efficient government. Nationalist China is arriving towards that goal through a variety of revolutions—political revolution, social revolution, intellectual revolution, and economic revolution—all taking place simultaneously. Figuratively speaking, China is like a family with many growing children, all contracting at one and the same time diseases like measles, mumps, tonsilities, (laughter) and whooping cough. Naturally, the family has incurred a few more doctor bills and drug store bills, which must necessarily upset the family budget system ; but the family is not insolvent. It may have to delay some payments, but as soon as the children get well and are able to produce and earn, the family budget can be easily balanced.

It is also to be remembered that the Nationalist government only began to exert its authority over the whole country since 1928. It took Dr. Sun Yat-sen, the founder of the Republic, and his followers fully seventeen years to deal with the militarists and reactionaries.

In June, 1928, a National Economic Conference, composed of leading industrialists, bankers, economists and government officials, was held in Shanghai, with T. V. Soong, Minister of Finance, as chairman, and adopted a well balanced program for governmental action, including reorganization of banking, currency, taxation and finance, disbandment of the army, reduction of troops and various other readjustments.

In June, 1929, the Minister of Finance took the first step toward the inauguration of a proper budget system. In the same year an economic commission of experts, headed by Professor Kemmerer of Princeton University, arrived in China, and after months of hard work and careful survey, has made many constructive suggestions for currency, banking, budget and financial reforms.

Recently China has invited Sir Arthur Salter and Mr. Robert Hass, well-known economists of the League of Nations, to advise China on economic rehabilitation and road construction. You see, therefore, that China is doing everything possible for reconstruction, and she is welcoming expert advice from the Western world.

China's foreign obligations at the close of 1930 amounted to $507,000,000 gold, including railway, secured and unsecured loans, but exclusive of indemnities. China is not in debt to your government, but owes less than $50,000,000 to American bankers, industrial firms and manufacturers—an amount which is less than one-fifth of one per cent of what the rest of the world owes you, namely, $11,000,000,000 of war debts and $16,500,000,000 of private debts.

China's domestic obligations at the end of 1930 amounted to 560,000,000 Chinese dollars, or roughly, $145,000,000 gold.

All in all, China's foreign and domestic obligations are slightly over $650,000,000. Even including the Boxer indemnities, which is being remitted or cancelled, it amounts to less than $850,000,000, or less than $1.85 per capita, which compares well with a public debt of $133.33 per capita of the United States.

Third : Reconstruction by international co-operation : In November, 1930, an Industrial and Commercial Conference was called by H. H. Kung, Minister of Industry and Commerce. It was attended by industrial leaders, prominent bankers and oversea Chinese. It was unanimously resolved that China should welcome foreign experts and foreign investments in an equitable and reciprocal manner as the Americans have welcomed European investments in the past. These must be non-political and in accordance with the principles and doctrine by Dr. Sun Yat-sen. International co-operation must be both moral and financial. What I mean by moral support is that foreign countries which have interests in China must do their part in removing what are recognized now to be nineteenth century prejudices. The United States government has exhibited remarkable leadership in signing the tariff treaty restoring to China tariff autonomy. The treaty has helped to strengthen the government's prestige and increase its revenue. In spite of adverse criticisms, China has worked out a reciprocal, scientific and extremely fair tariff schedule. There are still many other obstacles which are the outgrowth of antiquated treaties, absolutely detrimental to our welfare, and which we hope you will help us to remove in the same spirit as in the case of the tariff.

America can also help China by removing restrictions on Chinese goods entering America. Recently, several industries in China have been facing great difficulties, even bankruptcy, on account of the prohibitive duty of 50 to 250 per cent, and departmental restrictions. (Applause). For instance, the trade in egg products, which China has been selling to America for many years, is now

about ruined. China wants to buy American machinery, wheat, cotton, motor vehicles, rolling stock, chemicals and electrical supplies for her reconstruction work. China wants to trade with America; but trade is reciprocal. (Applause). Trade has no nationality. We need more market; you need more market. What is a market? A market is a place where you go to buy and you go to sell. If you only look for just a place to sell, then it is only half a market. We want to buy from you, but you must also buy from us. (Applause).

Another question of vital importance is the constant drop in the price of silver, until it has now reached the lowest level for all time, threatening the credit system of the world. The silver in an English shilling, with a face value of 25 cents, is now only worth 3¼ cents. Your American silver dollar is in consequence only worth a little over twelve cents. Gold standard countries suffer just as much as silver standard countries, if not more. It is principally because of the low price of silver that your surplus products cannot be directly distributed in Asia and indirectly in Europe and South America.

The world production of silver is about 250,000,000 ounces a year. Figuring at the market price to-day it is only about $70,000,000. If that were all, then the problem would be comparatively simple. But we must not forget the world's accumulated stock of billions of ounces of silver, which half of the world's population regards as its wealth, and in which they are now obliged to lose confidence. The United States Senate has wisely taken up the matter. Chinese bankers and industrial leaders have held many conferences, but the United States and China alone cannot solve this problem. It needs the immediate and serious attention of the statesmen of other nations, and their sincere co-operation. What is the matter with the League of Nations? What are the statesmen of to-day doing? Why not call a silver rehabilitation conference in the same manner as the Washington Disarmament Conference, or the World Conference.

Now, let us discuss international co-operation for the reconstruction of China by financial support. This, again, can be divided into two sections:

First, international private investments;
Second, governmental support.

Last year the American Foreign Power Company, headed by Sydney Z. Mitchell, bought the Shanghai Electric Plant and organized the Shanghai Power Company, the largest of its kind in China. Mr. Mitchell has shown remarkable leadership by his broadminded policy of co-operating with the Chinese, inviting Chinese capital to participate and Chinese business leaders to be represented on the Board. Such co-operation, I am sure, will bear fruit very quickly, as it meets the wishes of the Chinese people. It is clear that any reconstruction in China must be done from within and with the full co-operation of the Chinese people. It has been proven that foreign companies in China which pursued a conciliatory attitude towards the Chinese have succeeded better than the "die hards" who have not co-operated with the Chinese.

As regards government co-operation, it is my opinion that if the reconstruction of China can be regarded as one of the important ways out of the present world depression, then the problem can be easily understood. America's wealth in 1913 was one hundred ten billions; in 1929 it increased to three hundred twenty billions. The rest of the world owes you twenty-eight billions, including China's negligible amount of fifty millions, or one-fifth of one per cent. Your problem, it seems to me, is not whether or not you can collect these twenty-eight billions, but how to make your increased wealth of two hundred ten billions work, produce, and so keep up your prosperity. (Applause). The world has been greatly benefited by the development of America as an industrial and commercial nation; so a developed China, with her 460,000,000 population, will be another New World in the economic sense.

Nationalist China is ready to co-operate with the rest of the world. To prepare for such co-operation, the Minister of Railways, Sun Fo, the only son of the founder of the Republic, is busily consolidating the war-torn railroads and other transportation enterprises. It is needless to say that the immediate reconstruction of China would need public financing.

If the world wants quick development of China, then reconstruction credit should be arranged for the purpose of purchasing machinery, rolling stock and other material necessary for the rehabilitation work. If such credits are granted to China and China's economic progress is rapid, America and other nations that grant such credits will benefit equally with China, because they will create a larger market for their goods. Personally, for the permanent good of China, I would rather see a slow but steady development of our affairs, with the public financing done by the Chinese.

What does it matter if China's reconstruction should have to be extended twenty or even fifty years, so long as we are sure of it? A sure, slow progress is far better than a quick, radical one. Furthermore, public finance among the Chinese means more public interest in the governmental affairs. To-day Chinese bankers and business men have much more active participation in their government than ever before, and are surely graduating from a financial interest to a political interest. There will soon be a government in China like the government of the United States "of the people, by the people, and for the people." I believe such a development would make the foundation of Nationalist China as solid and secure as the foundation of Manhattan Island.

China has a definite program and definite principles by which to advance. There may be disturbances here and there, but Nationalist China will go on. China will not go "red." China does not believe in world revolution or any other fantastic scheme of upsetting the established economic order. She will mind her own business, as she always has done, and naturally, she expects the same from others. (Laughter and applause). She is awakened and is not going to sleep again. She solicits your friendly counsel, constructive criticism, and generous sympathy, as well as discerning patience. We overthrew monarchies and militarists, and we are suppressing Communists. We are very proud of what we have done. We are reconstructing our national affairs, and shall demonstrate to the world that the economic development of 460,000,000 peace-loving and cultured people is not only good for business, but for the benefit of all mankind.

Progress on Chinese National Railways

Peping-Liaoning Line

In 1929, when civil war broke out in China, the Peping-Liaoning Railway, formerly Peping-Mukden Railway, was forced to break into two sections with two administration offices, one in Tientsin and the other in Mukden. However, through the close co-operation of these two offices, the traffic of the line was not entirely interrupted and continued to give considerable satisfaction to the public. In the latter part of the year when the country was united, the unification of the Peping-Liaoning Railway became necessary in order to better the service for passengers and shippers.

Unification of the Line

The first step towards unification was to run the express trains through the two sections on regular schedule, and then consolidate the two administration offices, establishing the Head Office in Tientsin and abolishing the office in Mukden. Being confronted with the fact that a considerable volume of business originated in Mukden, it was decided that an office should be established there to handle that end. This office, named after the city, is called the "Seng Yang Office," and with this arrangement, the unification of the line took place on October 1, 1929.

Efficiency Commission

Upon unification, the railway was confronted with various problems of improvements and with a view to securing the highest efficiency a special commission was formed with the sanction of the Ministry of Railways to supervise these matters. This "Efficiency

Commission," with an experienced personnel has been doing its best for the good of the railway.

Hulutao Harbor

As the Peping-Liaoning Railway runs along the coast, a good commercial port is indispensable. Many years ago, the Railway Administration planned the construction of a harbor, selecting Hulutao as ideal for this purpose. The plans for the construction of this harbor was drawn up by the Railway Administration and with the approval of the Ministry of Railways, a contract was entered into with the Netherland Harbor Works Company to complete the work in five and a half years, at a cost of G.$6,400,000, payments to be made by monthly instalments of G.$95,000.

Loan Services Duly Repaid

The present administration is determined that its indebtedness be liquidated as soon as possible. In 1927, as a result of the Civil War then raging, the railway was compelled to postpone repayment of the Double Track Loan to the British and Chinese Corporation. In November, 1929, when the financial condition of the railway was slightly improved, the balance of the silver portion of the loan, amounting to $650,000, was paid up. A monthly instalment of £10,000 was also arranged to cover the sterling portion of the loan. Commencing from March, 1930, an additional monthly instalment repayment of $50,000 was made against the sterling portion of the loan so as to expedite the liquidation of the whole indebtedness at an earlier date. Since this arrangement was made, all payments have been met on due dates. The terms of the original British loan to the railway as to interest and amortization payments have been faithfully adhered to and the British and Chinese Corporation, recently expressed satisfaction that the credit of the railway has thus far been upheld.

Committee on Freight Rate

Realizing the bearing of freight rates upon the revenues of the railway itself as well as the development of trade and industry, a standing committee on freight rates has been formed.

Freight Rate on Grains Reduced

The recent famine conditions in the northern provinces materially increased the price of grain, and in order to transport cheaply the grain from other producing centers (especially from outside of the Great Wall) to these famine regions, the Railway Administration reduced the freight rate on December 5, 1929. As a result, the revenues of the railway have been increased, while lowering the price to the people.

Reduction of Freight Rate for Long Distance Haul

The Ministry of Railways having instructed the Peping-Liaoning Railway to make a careful revision of its freight schedules, a reduced schedule has been drawn up, taking sections of 100 kilometers each as the basis, the rates decreasing by percentages in every following section as compared with the foregoing sections. It ranges as follows :—

2nd	section—	5	per	cent	less	than	1st	section.
3rd	,,	— 6	,,	,,	,,	,,	2nd	,,
4th	,,	— 7	,,	,,	,,	,,	3rd	,,
5th	,,	— 8	,,	,,	,,	,,	4th	,,
6th	,,	—10	,,	,,	,,	,,	5th	,,
7th	,,	—12	,,	,,	,,	,,	6th	,,
8th	,,	—14	,,	,,	,,	,,	7th	,,
9th	,,	—16	,,	,,	,,	,,	8th	,,
10th	,,	—18	,,	,,	,,	,,	9th	,,

The freight rate for less than a carload is to be charged in addition with an extra amount of 30 per cent of the rate for a carload. Under this new arrangement the long distance goods traffic of the railway will be encouraged. The above rates have been in force since January 1, 1931.

Commercial Conference

One of the outstanding undertakings in the history of Chinese National Railways was the " Commercial Congress " held by the Peping-Liaoning Railway in December, 1929. The Administration, having emphasized the principle of " Railway Commercialization," called for a Commercial Congress in which various officials of banks and commercial concerns along the line were represented. The Congress lasted for four consecutive days during which, Taxation and Levies, Reduction of Rates, Transportation and matters concerning improvement of railway service were thoroughly discussed. The railway has been exerting its best efforts to carry out the recommendations, some of which are already in force, while others are still under consideration or undergoing intensive trials.

Reorganization of Traffic and Locomotive Departments

In view of the fact that the distribution of locomotives and cars on most of the European and Japanese railways is under the control of one single department, while Chinese railways adopt the practice of placing the locomotive working under control of a locomotive department, and passenger and freight cars under the traffic department, the practice has given rise to inevitable disputes and clashes of authority. The Peping-Liaoning Railway therefore, reorganized its traffic and locomotive departments by putting the control of all locomotives and cars under one single department, taking effect on August 1, 1930. The name of the traffic department was changed to the " transportation department " and that of the locomotive department to the " works department." Both departments are headed by a superintendent and an assistant superintendent. There are six divisions under the transportation department ; the Establishment ; Audit and Stores, Operating, Telegraph, Traffic and Technical Divisions, while the works department embodies three divisions ; the Secretarial, Technical and Accounts and Auditing Divisions. Each division has its own assignment of work to look after. Through this change, the control of locomotive working is placed under the transportation department to cope with the distribution of cars, and the telegraph division now deals only with telegraphic messages, telephones and wireless stations, leaving electric power and lighting to the works department. This reorganization has resulted in greater efficiency and co-ordination.

Freight Paid at Destination

Heretofore shippers have been required to pay freight charges on delivery of their goods to the railway for transportation, but the Railway Administration has accepted payment on arrival of goods at destination, since May 1, 1930.

Railway Risk Transportation

The Railway Administration has also decided to practice Railway Risk Transportation. Starting with carload lots, the system has been extended to cover all shipments. This arrangement commenced on October 25, 1930, and a special staff was carefully selected to supervise the work.

Peping-Kirin Through Service

For the convenience of the travelling public, the Peping-Liaoning Railway inaugurated on November 10, 1930, a through passenger train daily from both ends between Peping and Kirin.

Nanking-Peping-Mukden Triangular Express Train

In accordance with the instructions of the Ministry of Railways, a triangular train service connecting Nanking, Peping and Mukden was inaugurated by the Peping-Liaoning Railway on February 9, 1931. Three trains start simultaneously from Pukow (opposite Nanking), Chienmen (Peking) and Mukden five times a week, on Sundays, Mondays, Tuesdays, Thursdays and Fridays, filling a long-felt need for the resumption of direct train service between Nanking, Peping and Mukden. As soon as necessary rolling stock can be acquired, a daily service will be inaugurated.

Profits

The Peping-Liaoning Railway netted a profit of $19,001,908.99, at the end of the year 1929. The total revenue for the year was $37,514,590.10, while the total operating expenses amounted to $18,512,682.11. The total revenue for the year ending 1930, amounts in round numbers to $37,500,000.00 with operating expenses at $20,000,000,000, leaving a profit of approximately $17,000,000.00. From these figures, it is seen that the Peping-Liaoning Railway has done a large business during the two years carrying out many improvements and rendering costly services to the public.

Government Railway Earnings

The revenue of the following 13 Government railways, amounted to $104,848,368, during 1930, an increase of $1,059,622, over 1929.

Railways	*Revenue for 1929*	*Revenue for 1930*	*Increase or Decrease.*
Tientsin-Pukow ..	$11,999,888.00	$10,786,648.00 (—)	$1,213,240.00
Peiping-Liaoning ..	37,829,000.00	37,439,842.00 (—)	389,158.00
Shanghai-Nanking .	12,120,563.00	12,558,638.00 (+)	438,075.00
Shanghai-Hangchow-Ningpo . ..	5,855,415.00	6,641,712.00 (+)	786,297.00
Peiping-Suiyuan ..	5,611,998.00	4,667,738.00 ( )	944,260.00
Chengting-Taiyuan .	5,172,337.00	5,844,200.00 (+)	671,863.00
Taokow-Chinghua ..	993,291.00	1,406,273.00 (+)	412,982.00
Canton-Kowloon, ..	1,396,886.00	1,568,044 (+)	171,158.00
Hupeh-Hunan ..	2,188,806.00	1,471,330 (—)	717,476.00
Kiaochow-Tsinan ..	12,202,249.00	12,314,937.00 ( )	112,688.00
Nanchang-Kiukiang	1,439,245.00	1,234,395.00 (—)	204,850.00
Canton-Shiukwan .	3,625,748.00	5,670,454.00 (+)	2,044,706.00
Hulan-Hailun ..	3,353,320.00	3,244,157.00 (—)	109,163.00
	$103,788,746.00	$104,848,368.00 (+)	$1,059,622.00

Official 1930 statistics for the Peiping-Hankow, Lung-Hai, Kirin-Changchun, Changchow-Amoy, Taonan-Anganchi, Shenyang-Hailun, Kirin-Hailun and Kirin-Tunghua are not yet available, but the following returns for the Manchurian lines were given out in Mukden on February 15:

PEIPING-MUKDEN LINE

Passenger receipts	$15,804,420
Passengers carried	1,347,845 people
Goods receipts	$20,911,592
Goods tonnage carried	8,611,243 tons
Total receipts	$36,716,012

MUKDEN-HAILUNGCHENG LINE

Passenger receipts	$2,471,165
Passengers carried	1,347,855 people
Goods receipts	$4,905,772
Goods tonnage carried	758,155 tons
Total receipts	$7,376,937

SSUPINGKAI-TAONAN LINE

Passenger receipts	$2,052,032
Passengers carried	962,634 people
Goods receipts	$5,315,949
Goods tonnage carried	684,254 tons
Total receipts	$7,367,982

HULAN-HAILUN LINE

Passenger receipts	$952,894
Passengers carried	623,504 people
Goods receipts	$2,969,606
Goods tonnage carried	684,254 tons
Total receipts	$3,922,501

KIRIN-CHANGCHUN LINE

Passenger receipts	$927,206
Passengers carried	739,253 people
Goods receipts	$2,043,433
Goods tonnage carried	684,254 tons
Total receipts	$2,967,550

KIRIN-HAILUNGCHENG LINE

Passenger receipts	$817,123
Passengers carried	283,024 people
Goods receipts	$937,854
Goods tonnage carried	323,303 tons
Total receipts	$1,754,977

KIRIN-TUNGHUA LINE

Passenger receipts	$491,960
Passengers carried	366,797 people
Goods receipts	$1,140,786
Goods tonnage carried	474,427 tons
Total receipts	$1,632,747

TAONAN-ANGANCHI LINE

Passenger receipts	$729,372
Passengers carried	418,349 people
Goods receipts	$867,039
Goods tonnage carried	317,495 tons
Total receipts	$1,596,411

TSITSIHAR-KOSHAN LINE

Passenger receipts	$398,626
Passengers carried	270,617 people
Goods receipts	$1,155,888
Goods tonnage carried	319,160 tons
Total receipts	$1,554,515

GRAND TOTAL

Passenger receipts	$24,644,803
Passengers carried	12,082,937 people
Goods receipts	$40,244,833
Goods tonnage carried	13,223,264 tons
Total receipts	$64,889,636

Converted into Gold currency, the above total receipts amount to only G.Y26.000,000 odd

Facing Bankruptcy

The general financial position of the Government Railways was dwelt upon by Minister Sun Fo in his opening speech before the National Railway Transportation Conference held in Nanking during March. Minister Sun Fo told his audience that: "With the cessation of military operations, and the restoration of national unification, the foremost task of the Ministry was the reorganization and development of the existent railways. The various railways were now on the verge of bankruptcy, the total obligations amounting to the staggering figure of more than $1,000,000,000. According to reports submitted by the Shanghai-Nanking Railway Administration, it had to provide almost three million dollars this year to meet loan obligations and several million dollars for the purchases of new rolling stock. The number of freight cars available on the Peiping-Hankow line had dwindled from 4,000 to 1,000."

Increased Tariffs

Since the enforcement of the revised passenger and freight rates on March 16, a substantial increase in the income of the Shanghai-Nanking and Shanghai-Hangchow-Ningpo Railways is reported. The average daily receipts on the Shanghai-Nanking Railway total $40,000, an increase of nearly $10,000. On the Shanghai-Hangchow-Ningpo Line, the income has increased by one-third, the Administration receiving over $20,000 daily. If the increase is maintained the 1931 revenue of the Shanghai-Nanking may reach $15,000,000, and the Shanghai-Hangchow-Ningpo $8,000,000.

Tariffs on other Government railways are also to be increased after May 1, as follows:—

Taokow-Chinghua and Kiaochow-Tsinan Railways, 20 per cent on both passenger and freight tariffs;

Nanchang-Kiukiang Railway, 15 per cent on passenger and freight tariffs.

Wuchang-Changsha section of the Canton-Hankow Railway, 10 per cent on passenger and freight tariffs.

Peiping-Hankow, Tientsin-Pukow, Peiping-Suiyuan and Lung-Hai Railways, 15 per cent. on freight tariff only.

On the Peiping-Liaoning, Chengting-Taiyu, Canton-Kowloon Railways, and Canton-Shiuchow section of the Canton-Hankow Railway, no increase in rates will be made for the present.

Rehabilitation Program

To handle the increasing volume of business on the various Government railways, new rolling-stock is necessary and the Purchasing Commission is preparing to rush tenders for 200 cars and six "Pacific" type locomotives.

The Tientsin-Pukow Railway Administration is increasing the efficiency and safety of its service and all bridges damaged by the military operations last year, are being repaired or replaced by new ones.

Large-scale rehabilitation of all the Government lines, such as the repair of railway bridges, renewal of dilapidated tracks and provision of modern equipment, estimated to cost $100,000,000, will be carried out over a period of three years.

With two-thirds of the British Boxer Indemnity Refund earmarked for the improvement of the railways, it is understood that the necessary funds will be provided as the rehabilitation program is carried out.

New Manchurian Lines

Rapid strides are being made by the Northeastern provinces in the development of communications. Three additional railways in Liaoning province will be put in hand this year by the Northeastern Communications Committee. One line will connect Liaoning with Kirin by linking up Chaoyangchen, with Fusung, a distance of 49 kilometers. The Shanyang-Hailung Railway Administration will be responsible for the construction of the line which is estimated to cost $2,119,900, to be appropriated from the earnings of the railway. Work is expected to start by the middle of April.

The leading officials and merchants of Pehchenhsien, in western Liaoning, have also petitioned for the construction of a light railway from Pehchenhsien to Kowpangtse, about 17 miles to the south. As the cost of construction is only 400,000, there will be little difficulty in raising this amount between the Government and the merchants. The Peiping-Liaoning Railway will carry out the construction.

Another line under consideration is one between Tunghwa and Changpaishan in eastern Liaoning. The plans call for the building of a highway at a cost of $358,800, and as more funds are available, a railway will be built. Work on the highway is to be started in April and completed by the end of November.

A scheme proposed by Mr. Kao Yun-kun, Managing-Director of the Hulan-Hailun Railway, for the construction of a branch line from Suihwa station to Holikang, a coal-producing district, has been approved by the Heilungkiang Provincial Government. The projected line will be 560 kilometers in length and is estimated to cost $30,000,000. It was planned to raise two-thirds of the amount jointly by the Heilungkiang Provincial Government, the Holikang Colliery and the Hulan-Hailun Railway Administration and a loan raised for the balance ($10,000,000) with the coal mine as security. It is now reported that the management has opened negotiations with the Soviet for a loan.

Kirin-Tungkiang Railway

Work on the construction of the Kirin-Tungkiang Railway will be started next month. The railway, about 700 miles in length will run in a general northeasterly direction from Kirin through Shulan, Wuchang, Maoerhshan, Pingchow, Fangcheng, whence it will follow the course of the Sungari River to Sansing, Huachuan, Fuchin, and Tungkiang. The northern section—from Maoerhshan to Tungkiang—will be constructed first. Work on the road bed will be completed before the end of the year when the laying of rails and sleepers will begin. The entire railway will take five years to build; the first section to be ready for traffic by 1934 and the remaining portion in 1936.

The total cost of construction is estimated at $25,000,000. The initial expenditure of five million dollars for the first year will be supplied by a native banking group; the balance to be provided by the Kirin Provincial Government in annual instalments of $5,000,000. General Chang Tso-hsiang, Chairman of the Kirin Provincial Government says that he will endeavor to raise the entire sum within the province without resorting to outside help, so as to make the railway a provincial enterprise both in name and in fact.

Sintsu Coal Mine Branch

The Northeastern Communications Committee, is also to start constructing the railway connecting Fanshanjen of the Tungliao-Tahushan branch line of the Peking-Mukden railway with the Sintsu Coal Mines. The line will be Government-owned and built by the engineers of the Peking-Mukden Railway, the Administration acting as contractors. The coal mines of Sintsu are operated by the Chinese company Yufu in Mukden, and the quality of the coal is considered as equal to the Fushun output.

Huainan Light Railway

Construction of a light railway linking up the Huainan mining district in eastern Anhwei with the important river port of Wuhu, on the Yangtse river, is about to be started. The National Reconstruction Commission, has purchased over 700 tons of steel rails in Shanghai, and as soon as the consignment reaches its destination, the building of the railway will begin. The proposed railway is about 130 miles long and cost of construction is estimated at $4,000,000.

The Huainan coal mine possesses abundant anthracite deposits. When the mine was first opened, the daily output was about 100 tons of coal, but the yield has been increased to 30,000 tons daily.

Shantung Railway Extensions

The Ministry of Railways intends to build a branch railway from Tsinan to Taokow, in northern Honan, through southern Hopei. The Kiaochow-Tsinan Railway has however petitioned for a prior extension to Lintsing, a distance of 60 miles from the Shantung Provincial Capital. The total cost of construction is estimated at $6,000,000; but by utilizing available railway material from the existing railway, the expenditure may be reduced by one half. The railway recently purchased one hundred 40-ton freight cars from Japan and now proposes to purchase an additional 200 cars in the near future. The Changtien-Poshan branch of the Kiao-Tsi Main Line is to be extended to connect with the Tientsin-Pukow Railway at Taianfu *via* Laiwu, approximately 100 miles.

Lung-Hai Progress

The Lung-Hai Railway Administration announces that construction of the Lingpao-Tungkwan section of the line will be concluded in September. The section now being built is 72 kilometers in length, passing through the typical loess formation along the south bank of the Yellow river with unusually heavy earth work and tunnelling necessitated.

Construction of this section has been repeatedly interrupted by military disturbances during the past years. About 90 per cent of earth work has been completed. Seven out of 11 tunnels have been finished with two others scheduled to be opened within a few weeks. The two uncompleted tunnels, one in Lingpao and in Tungkwan are long and difficult, but the former will temporarily be supplemented by a variant built along the Yellow river for temporary routing of trains, and the latter going through the city of Tungkwan will not affect the reaching of that city for the time being.

Steel bridges and rails have been purchased out of a portion of the Belgium returned Boxer Indemnity Fund allotted to Lung-Hai and they are being transported from Pukow to Lingpao. Erecting of bridges is now in full swing and laying of tracks will soon be initiated. It is expected that rails will reach Wenhsiang Hsien in the latter part of June and Tungkwan in October. The extension of the line will be followed immediately with the aim of reaching Sianfu by the end of 1932.

Arrangements are now being made to push forward the construction of this section and Mr. Ning Hung-hsuan, chief engineer of the Lung-Hai Railway, has been instructed to proceed to Tungkwan and recruit workers amongst the refugees in conjunction. Surveys of the Tungkwan-Sian section will be hastened so that actual construction work may be started as soon as possible.

The material for the building of the large railway bridge at Hankukwan has arrived at its destination. It is anticipated that railway communications as far as Tungkwan on the Lung-Hai Railway will be open by June of this year.

It is also reported that the Ministry of Railways has decided to build this year a branch line from Tungkwan to Anyiin, in Southern Shansi.

Chungshan-Fatshan Railway

Following the Ministry of Railway's decision to connect Fatshan and Chungshan by railway line, the Yueh-Han Railway Administration has despatched engineers and experts to re-survey the whole line, a distance of 70 miles.

The cost of construction is estimated at $13,000,000 of which $6,000,000 will be appropriated from the Boxer Indemnity Refund, while the balance is to be raised from the people. The total length of the bridges will be about 12,000 feet.

A branch line with a length of 5½ miles starting from Siulam, *via* Kiuchow and Kinpao, to Koochen is also to be constructed so as to connect the Kongmoon-Sunning Railway.

Canton-Kowloon Dispute

The Chinese section of the Canton-Kowloon Railway is pressing the British section in Kowloon for revision of the railway agreement.

The Chinese section of the railway contends that under the present agreement, it is reaping too small a percentage of profits. The railway is 112 miles long, of which 89½ miles were constructed by the Chinese, but, according to the present arrangement, the Chinese section receives only 65 per cent of the receipts.

It is argued that inasmuch as the Chinese section is nearly 80 per cent of the railway, its percentage should also be nearly 80 per cent. In other words, the Chinese claim is based on mileage.

The management of the British section points out that the mileage standard cannot be applied because there are several long tunnels on the British section, the construction of which was more expensive than any other part of the line.

Sir William Peel, Governor of Hongkong, is understood to have accepted, in principle, that the agreement be revised but expresses the view that the Chinese section should be improved until it is on a par with the British. In recent years the Chinese section has deteriorated in many respects, and for this reason the running time for express trains has risen from three hours and 50 minutes to four and a half hours.

Leading Tool Companies in Merger

ANNOUNCEMENT has been made of a merger between two of the leading American manufacturers of fine tools—The Millers Falls Company of Millers Falls, Mass. and the Goodell-Pratt Company of Greenfield, Mass. The Millers Falls Co. will be the operating company and the officials are to be the present officials of the Millers Falls Company—Philip Rogers, President ; George U. Hatch, Vice-President ; John W. Smead, Vice-President and Earl D. Holtby, Treasurer. Wm. M. Pratt, President of the Goodell-Pratt Company has been elected a member of the Board of Directors, composed of the following additional members : E. P. Stoughton, Chairman, Philip Rogers, E. D. Holtby, J. W. Smead, G. U. Hatch and G. C. Lunt. Mr. Roger L. Bracken, Export Manager of Millers Falls Company will supervise the export sales of both organizations.

This consolidation will bring together the manufacturing experience and merchandising ability of the two concerns, with a combined background of over a hundred years of fine tool manufacturing and merchandising. The two lines of tools will continue to be manufactured under their present internationally-known trade marks.

History of the Companies

The Millers Falls Company has been engaged in the manufacture of high grade tools since 1868 ; and was the first of the tool manufacturers to bring out a hand drill. It has also led in the development of numerous other products. It has been a pioneer in the distribution of hack saw blades.

Since 1927, the Millers Falls Company has become one of the leading factors in the electric tool field. The marketing of these tools is handled by a corps of specially trained salesmen. The Millers Falls Company has been one of the leaders in the national movement aiming towards concentration of purchases and has developed a broad line consisting of twelve major divisions to help the hardware distributor effect the economics that come from this policy. These twelve divisions include electric tools, hack saw blades and frames, breast drill, automatic tools, levels, mitre boxes, braces, planes, hand drills, auger bits, nail sets and punches.

The Goodell-Pratt Company was started in 1888, manufacturing automatic drills, hand drill, breast drills, drill chucks and automatic screw drivers. In 1900 the manufacture of precision tools was started under the name of the Massachusetts Tool Company. This company together with the Lavigne Micrometer Company of New Haven, Connecticut, both of which had been acquired by the Goodell-Pratt Company, controlled many patents which form the basis of the Goodell-Pratt precision tool line. The factory equipment of the Goodell-Pratt Company is among the finest in the industry for the manufacture of precision tools.

William M. Pratt, President of the Goodell-Pratt Company, has long been identified with the tool industry and has travelled widely abroad developing the foreign markets for this company. The slogan " 1,500 Good Tools," familiar to tool users throughout the world is an indication of the breadth of the Goodell-Pratt line. The Goodell-Pratt catalog of 400 pages, lists among others the following classifications :

Machinists' and Precision Tools, Iron and Wood Levels, Chisels and Punches, Glass Cutters, Automatic Hand and Breast Drills, Hack Saw Blades and Frames, Automatic Ratchet and Plain Screw Drivers, Automotive Tools, Vises, Electric Drills, Mitre Boxes, Light Shop Equipment, Tap Holders, Carpenters' Tools.

The overseas customers of both companies will continue their contacts with each Company direct as heretofore.

An Appreciation

As a rule we refrain from reproducing the many flattering references to the value of *The Far Eastern Review* as the representative industrial magazine of the field it covers, holding to an old fashioned editorial belief that the best advertisement of a newspaper, is the newspaper itself.

It is with pleasure, however, that we reproduce the following appreciative editorial from *The Nautical Magazine*, of Glasgow, a publication now in its 121st year, and recognized throughout the world as the leading authority on mercantile marine matters.

"Mr. George Bronson Rea, the editor and publisher of this excellent monthly which deals so thoroughly with Far Eastern trade, finance, shipping and engineering, is to be congratulated on the production of one of the most important monthly journals of the Far East which should be closely studied by those who desire to increase British commerce. The enormous activities displayed in its pages cover the principal ports and places along the Far Eastern seaboard. The photographs and drawings are as impressive as the authoritative articles which fill the pages of the production and which deal with such subjects as motor shipbuilding in China and Japan, oil refining, electrical power, the fishing industry, radio, waterworks, building, roadmaking, and commercial development over an extensive area. Banks, factories, and shipping houses are furnished with such important information that they should in their own interests study the pages of this unique monthly which conveys the views expressed by Japanese and other correspondents.

"A matter which is of particular interest to readers is contained in the Marine Section of the journal. It gives details of the new dockyard which has been opened at Kowloon and which has four patent slipways for vessels up to the length of 325 feet, and two fitting-out wharves with heavy-lifting cranes and railways which cover the whole plant. The general use of machinery of modern type driven by electricity brings the new yard into line with up-to-date shipbuilding organization. China owns about 240,000 tons of coastwise shipping, but half of it is uneconomical as the ships are so old and out of date and the expense of keeping these ancient steamers in repair leaves no profit whatsoever."

World Wide Depression Subsiding

Signs are apparent of a steady though gradual improvement in world trade, declares James A. Farrell, Chairman of the National Foreign Trade Council, in issuing the call for the Eighteenth National Foreign Trade Convention, to meet in New York on May 27, 28 and 29 next. World exports for 1930, as estimated by the Council, amounted to about $27,000,000,000, almost six and a half billion dollars less than the export trade of 1929. In actual volume of export trade, however, figures now available show that, accounting for reduction in prices, the world in 1930 carried on 90 per cent of the export trade of 1929, and almost a billion dollars more in exports than before the war.

In urging American foreign traders to consider very carefully the problems of the present year, Mr. Farrell says :

" There are indications that the world wide depression in business, with which we have been dealing for several months, is subsiding and that the upturn is beginning.

" Our commerce confronts a situation which merits the consideration of all concerned in foreign trade. It is a time for thorough examination of economic conditions, and for practical demonstration of that spirit and habit of co-operation that so signally marks American foreign trade practice."

Progress in Amoy

"Transforming the Dirtiest City in the World" into a Health Resort

FOREWORD

Like Canton, the city of Amoy is passing through a period of rapid expansion and improvements that is transforming the filthy, pestilential old stink hole into a modern sanitary salubrious place of residence for the people of South China that can be equalled only by Tsingtao in the North. Amoy is demonstrating the extraordinary recuperative powers of the Chinese people, when they are given even a short respite from civil warfare and oppression under a fair government providing guarantees for the protection of lives and properties. Amoy is fortunate in being the home of the most enterprising and adverturous people in China, men who have emigrated to other countries amassed fortunes and returned to their native city to end their days and contribute their experience and wealth to its betterment and modernization. Amoy is a city of returned millionaires who are ready to invest their savings in local property, public utilities and industrial undertakings, if they can be assured of any sort of stable conditions. Amoy is fortunate in being located on an island, sufficiently distant from the mainland to be immune from the depredations of the Fukien bandits and wandering armies out for loot. These natural conditions which in themselves constitute a safeguard against undue military interference, coupled with the enterprise of men who amassed fortunes in other lands, have converted "the dirtiest city in the world" into a clean wholesome place to live in, an example of what can be done elsewhere in China once its people are relieved of the staggering yoke of supporting a useless army, and permitted to work out their own salvation without interference on the part of oppressive officials.

The following article on the transformation of the worst pest hole in Asia into a modern city, is a tribute to the Chinese engineer and the men who reposed faith in him and backed his plans with the money to carry them out. It is of special value at this time as supporting the address of Mr. K. C. Li before the Foreign Policy Association of New York, in which he cites the progress of Amoy, even in the trying times of the past few years as an indication of what we may expect in other large cities of China, as soon as political stability and peace prevails. The progress of Amoy is typical of what is going on in other large cities of China, released from the heavy drain of maintaining huge armies. Canton, freed from the incubus of financing the Northern Expedition and permitted to use its revenues for its own improvements has embarked on a grand scheme of public works, which will rapidly transform this city into the chief commercial center of China, eclipsing even Shanghai as a center of wealth, commerce and industry. A start has been made, and the outlook for the future is exceptionally bright.

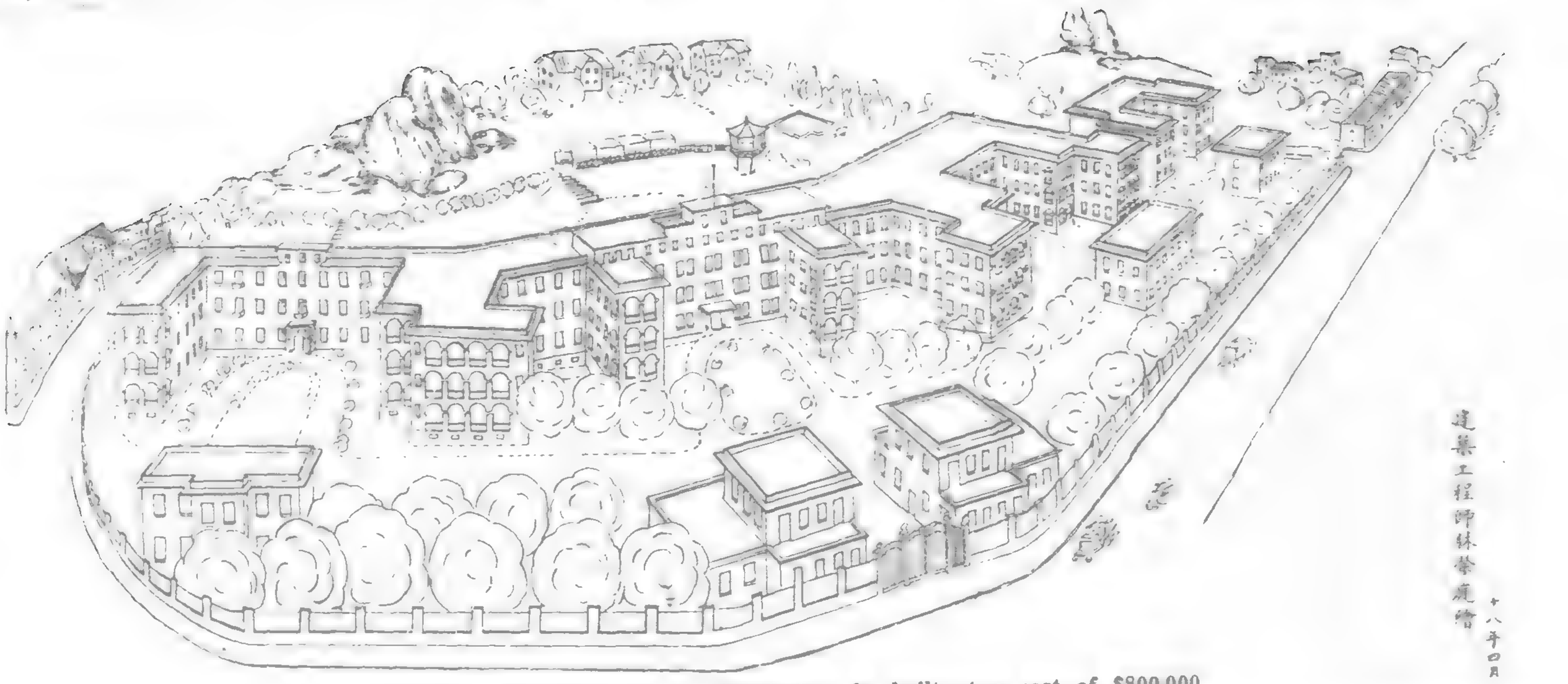
PUBLIC WORKS IN AMOY

By FANG FU-AN

AMOY is expanding rapidly. At its present rate of development, the port will soon be a prominent factor in the trade between Shanghai and Hongkong. Located on the island of Amoy, 300 miles north of Hongkong, 200 miles south of Foochow and 550 miles south of Shanghai, the port is served by three regular lines of steamers—the Java-China-Japan (Dutch), Butterfield and Swire (British,) and the Douglas Line (British)—plying between Hongkong, Amoy, Foochow and Shanghai. Amoy has lagged behind other ports in its development. In times gone by, pirates frequented the port and made it unsafe for residence or trade. The streets were narrow and crooked, with sluggish sewers flowing underneath rudimentary and uneven flagstones. The lack of water supply and sanitary safeguards converted it into a focus of infection. Epidemics of small-pox, cholera, dysentery and plague broke out with frequent recurrence. These conditions have changed in the last few years, and Amoy is rapidly being transformed into a modern city and port.

Before 1900 water for Amoy was carried over by boats from the adjacent island of Kulangsu, where it was collected into cisterns from rainfall. Later on, with the development of Kulangsu, its water supply became inadequate for the requirements of its residents, and the Municipal Council cut off the supply for Amoy. This compelled the people of Amoy to bring water from a district twenty miles away by small water boats, and on stormy days this

Road Construction in Amoy

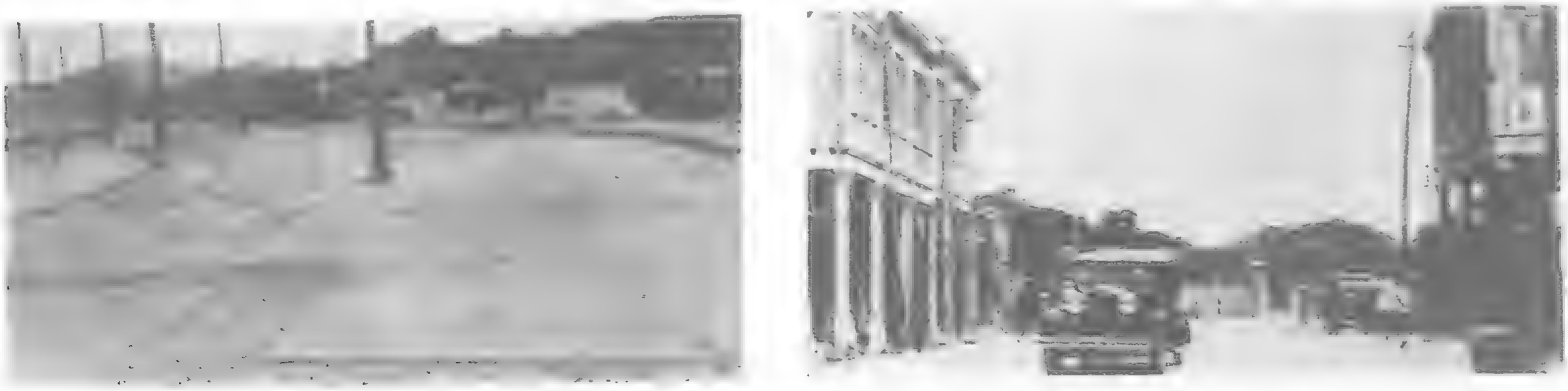


Dr. Sun Yat-sen Memorial Hospital to be built at a cost of $800,000

supply was practically cut off. As a result of this lack of water, three great epidemics decimated the inhabitants of the port. Only the introduction of a modern system of water supply has saved Amoy from being deserted by the people. The movement for a modern water supply was first started in 1905. The then magistrate of the city invited Japanese engineers from Formosa to make a general survey and report on the possibility of constructing a water system on the island. These Japanese recommended drilling wells. The first well was dug close by the front gate of the Magistrate's *yamen*, but was abandoned because of the difficulty of drilling through the rocks. Several wells were dug in other districts of the island but none were able to supply the necessary quantity of water.

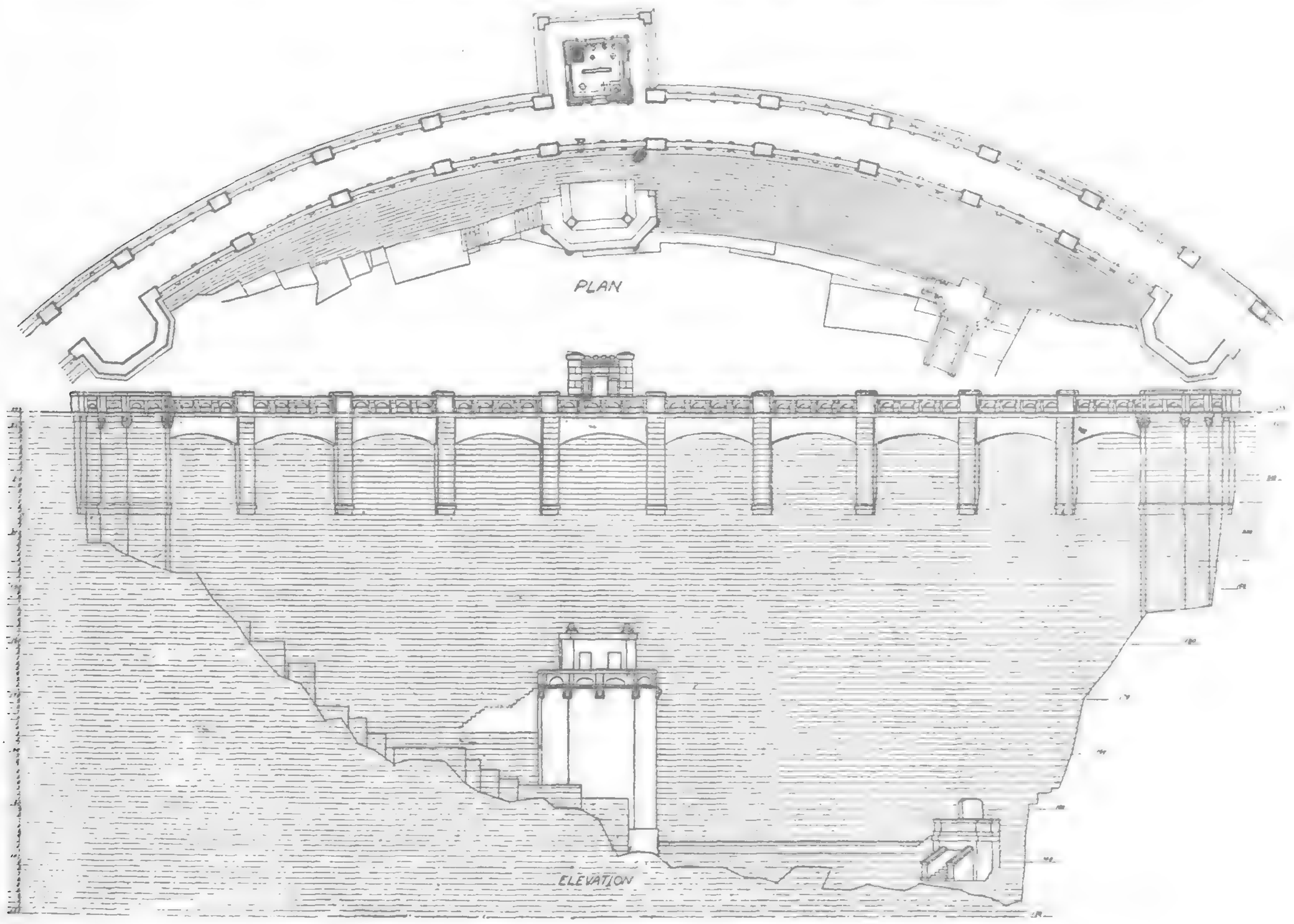
In view of the urgent need for water, another movement was started in 1910 to solve the problem by inviting a British engineering firm to make a survey of the island. Their unfavorable report brought great disappointment and it was feared that the residents would have to leave the city. At this time, a young Chinese engineer stepped in. Mr. Homer Ling, a native of Amoy, who graduated from Harvard University and the Massachusetts Institute of Technology, returnd to his home in 1921, after working as an engineer on the Grand Canal Improvement Board in North China. A preliminary survey of the island, convinced him of the possibility of constructing a modern water works, taking the water from the mountains. It required more than two years to convince the local merchants of the practicability of his plan and to finance it. The success of this scheme stimulated the people of Amoy to carry on other constructive enterprises. About two years were spent in prospecting and locating the available sources of water supply. The final plans and surveys were drawn up in 1923, and received the support of a number of prominent merchants, amongst whom, Mr. Huang Ijoe assumed the largest responsibility. Mr. Huang, born in Chuan Chao, Fukien Province, in 1868, for the last six years has been President of Chamber of

The Old and New in Amoy, Handsome Reinforced Concrete Buildings of Three and Four Stories with well paved wide streets fifty and sixty feet wide have transformed the old pest hole into a healthy, hustling and progressive city



Road Construction in Amoy

Panorama View of Choui Li Dam near Amoy. The Building of this Reservoir by a Chinese Engineer, made possible the transformation of Amoy into a modern, progressive and healthy center of commerce



Plan and Elevation; Amoy Waterworks Dam

Commerce, President of the City Improvement Board and also the first Chinese member of the Kulangsu Municipal Council. Since his return from Java, where he made his fortune as a sugar merchant, he has been very actively connected with all plans for city improvement. At present, he is the manager of the Amoy Electric Light Company and the Amoy Waterworks. Mr. Huang, furnished the first million dollars for the young Boston graduate to carry out his project, which at that time seemed almost a dream. Now, after seven and a half years of labor, Amoy boasts a model waterworks system in excellent running order. The filter beds and the ozonating plants are amongst the best in the world and next to none in the Far East. The reservoir is located in the hills far away from danger of contamination. At present, the plant supplies one million gallons of pure water every day. In addition to the local consumption, the plant is supplying water also to the steamships passing through the port. In 1929, when Hongkong suffered from a water famine, the Amoy waterworks was called upon to relieve the distress, shipping a distance of 300 miles, a considerable amount

Amoy Waterworks: General Layout of Filter Plant, Distribution Reservoir, Surrounding Wall, etc.

of pure water. The people of Amoy realize that the waterworks has saved the city from cholera, dysentery, typhoid and other epidemics which formerly took a heavy annual toll of life.

The reservoirs were constructed in the hills five miles from the city, by building a dam of cyclospean concrete which holds 400,000,000 gallons of water, enough for one year's consumption. The water is led from the reservoir through pipes by gravity to filter plants three miles away. There are three slow filter sand beds, each with a capacity of filtering

Office Building of Amoy Waterworks

300,000 gallons of water a day, or a total of 900,000 gallons of pure water daily. The raw water is carefully analyzed. However, a sterilization plant using ozone was built. In the extension project, an additional reservoir will be built near the site of the present one at a cost of another $1,000,000. The company is also laying pipes on the island of Kulangsu which will cost $400,000. Water will be carried over to the island by a water boat holding 400 tons and pumped up to a reservoir on the top of central hill for distribution to consumers.

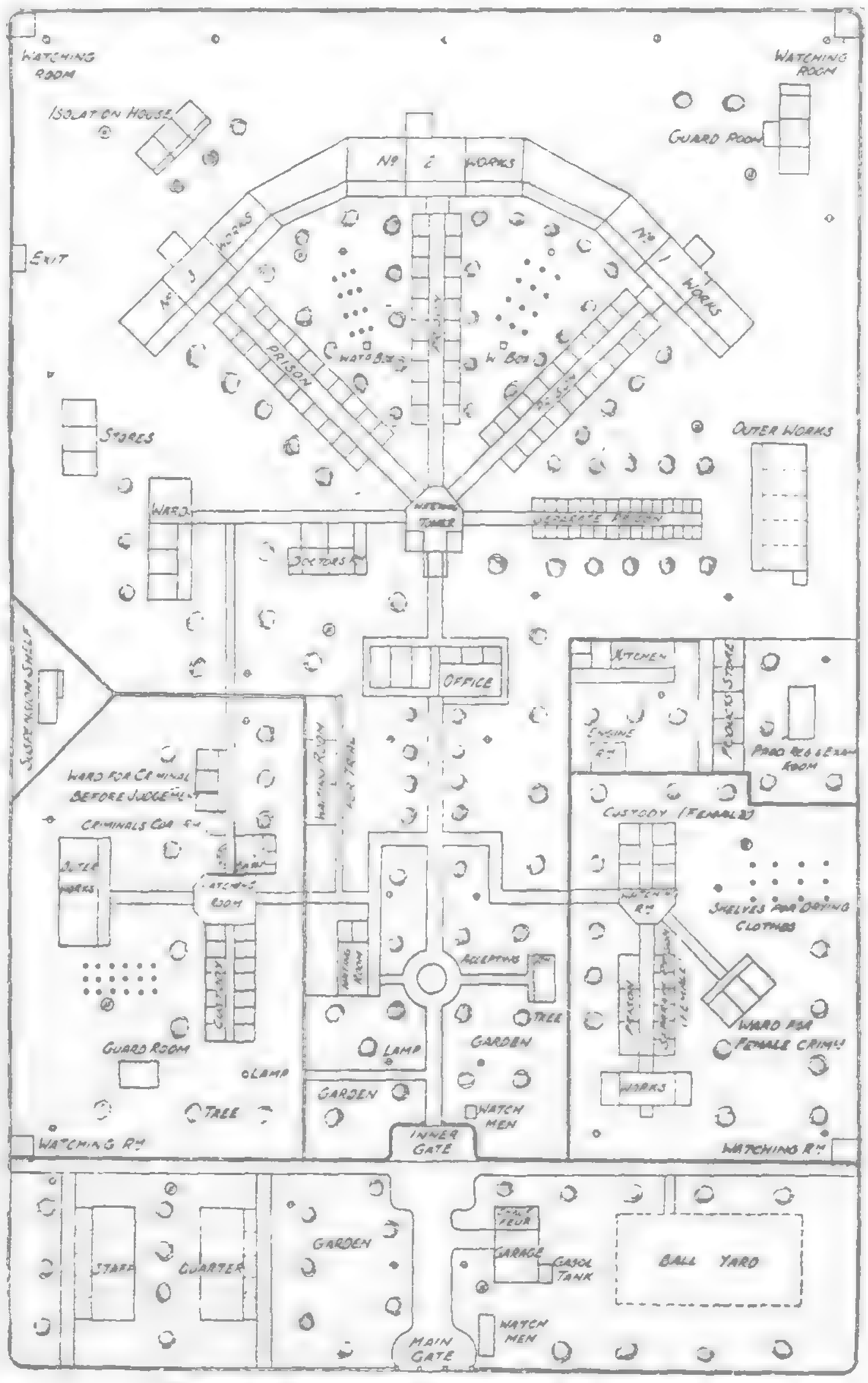
Dr. Sun Yat-sen (Chung Shan) Memorial Park at Amoy

The success of the waterworks has encouraged the carrying out of other public utilities and general construction in Amoy, such as a complete telephone system and electric lights (both financed entirely by Chinese) road building and erection of concrete buildings. The Municipal Department of Construction is now following the example of Hongkong, planning to move the mountains and dump them into the sea in order to give space for the development of the city, and reclaim the foreshore. By this method, large areas of land have been reclaimed and sold at a price which provided tremendous sums of money for the construction of roads, etc. Since August, 1927, to 1930, a total of 10,000,000 sq. ft. of new land has been reclaimed, and on which, high concrete buildings have been built. By the end of 1935, another 50,000,000 sq. ft. of land will be reclaimed. By the end of 1930, 148,508 feet of motor roads with an average width of 30 feet have been completed in the city. In addition, another 150,000 ft. of motor roads were built on the island connecting the villages with the city. Along these newly opened roads, settlements are being established to which the city residents are moving. It is expected that many more will take advantage of this opportunity for securing healthful living conditions and relieve the congestion in the city. It is also expected that the widened streets will bring more trade and business to the city. A modern sewer system is to be constructed within a period of five years.

Among all the construction work, the building of a new bund is the most difficult. The levelling of mountains is bad enough, but the soft mud under the bottom of the sea with a depth of seventy feet on which to construct a new bund with modern wharves is worse. A scheme to construct another 2,000 feet of bunding in Amoy, to cost $2,000,000 has been approved by the city authorities, and tenders will be invited in the near future. Steel piling, seventy feet long, will be driven down to the rock, the space filled in and a concrete super-structure built. When completed, this will give the bund a width of sixty feet. In addition to the bund, the 7,000 sq. ft. of land will be reclaimed which in due time will be the most valuable district of the entire city. This project which is to be started by the end of this year is to be completed by the end of 1933. In the carrying out of its improvements, over 300,000 graves were moved, some coffins lying three layers deep. The price of removal and re-interment of in regular cemeteries in the country, cost the city $450,000. The former grave lands, is selling at four to five thousand dollars per mow, that is, $24,000 to $30,000 per English acre. All property has appreciated in value in the new city, and in view of easier communication, greater comfort and time saved, the time will soon come when foreigners as well as Chinese will build their residences in Amoy instead of Kulangsu.

The Chung Shan Park, a memorial to Dr. Sun Yat-sen, was recently completed at a cost of $800,000. This park occupies an area of 15 acres with old trees, public halls, athletic ground, gardens, and a lake. A Public Library, a

(Continued on page 222).



Plan of Shihming Model Prison at Amoy

Erection of Digesters

Interior of Mill Building

New Paper Mill at Foochow

By FANG FU-AN

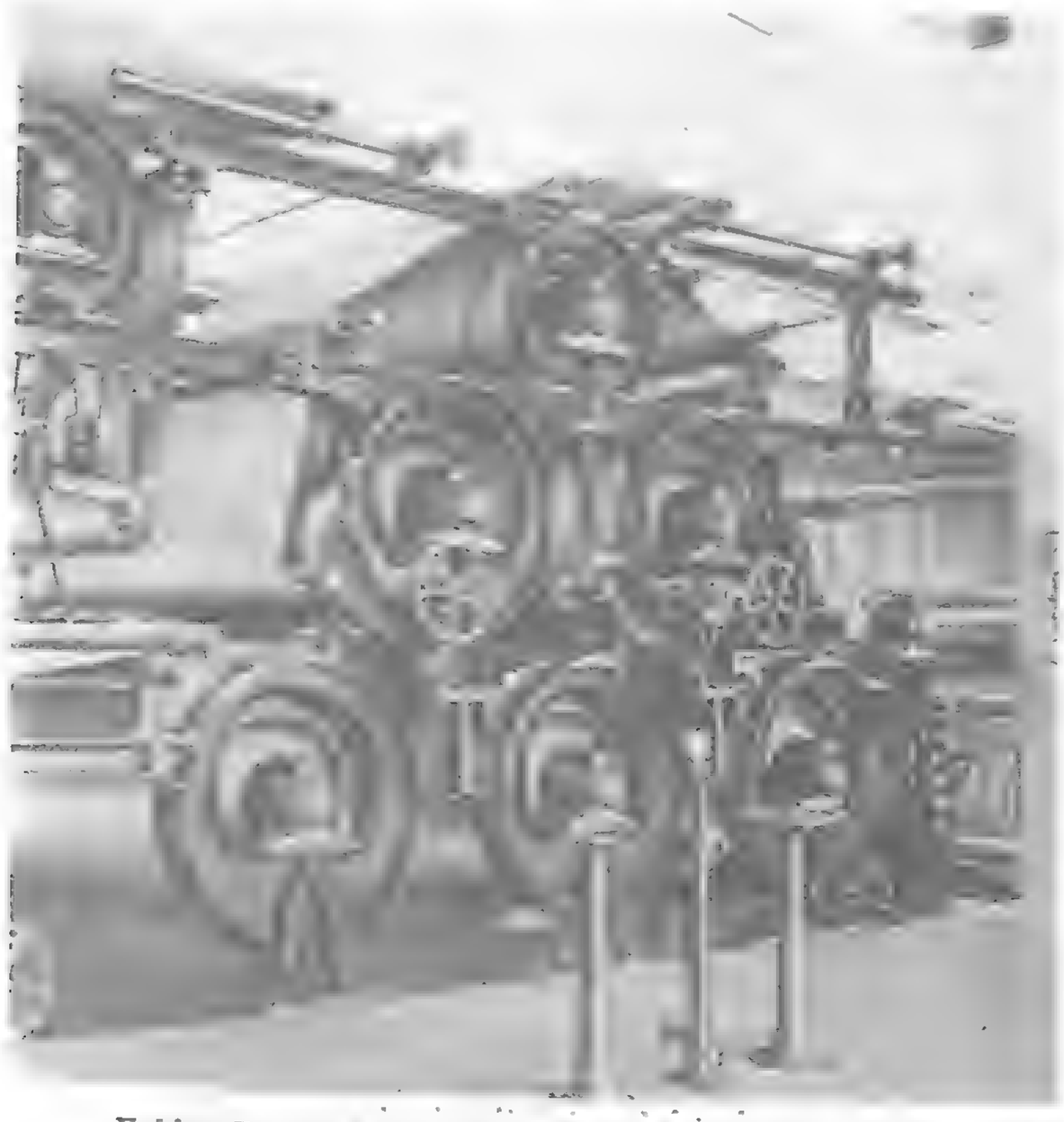
With the steady gr wth of the public school system in China and the general advance of education, the demand for paper has been tripled since 1920. China imports practically all her paper, which in 1920 amounted to $20,694,093, and $50,000,000 in 1925.

China needs paper mills of her own, especially where there are abundant supplies of raw material. In Fukien province there is a rich supply of bamboo, weed, rice straw and several other wild grasses and wood. These materials cost practically nothing in the province except the labor to carry them from the interior to the paper mill. It is estimated that raw material costs $14.78 per ton in Fukien, against $90 per ton in other countries, a difference of $75.22, in raw material for each ton of paper manufactured, aside from the cheap cost of labor in this country.

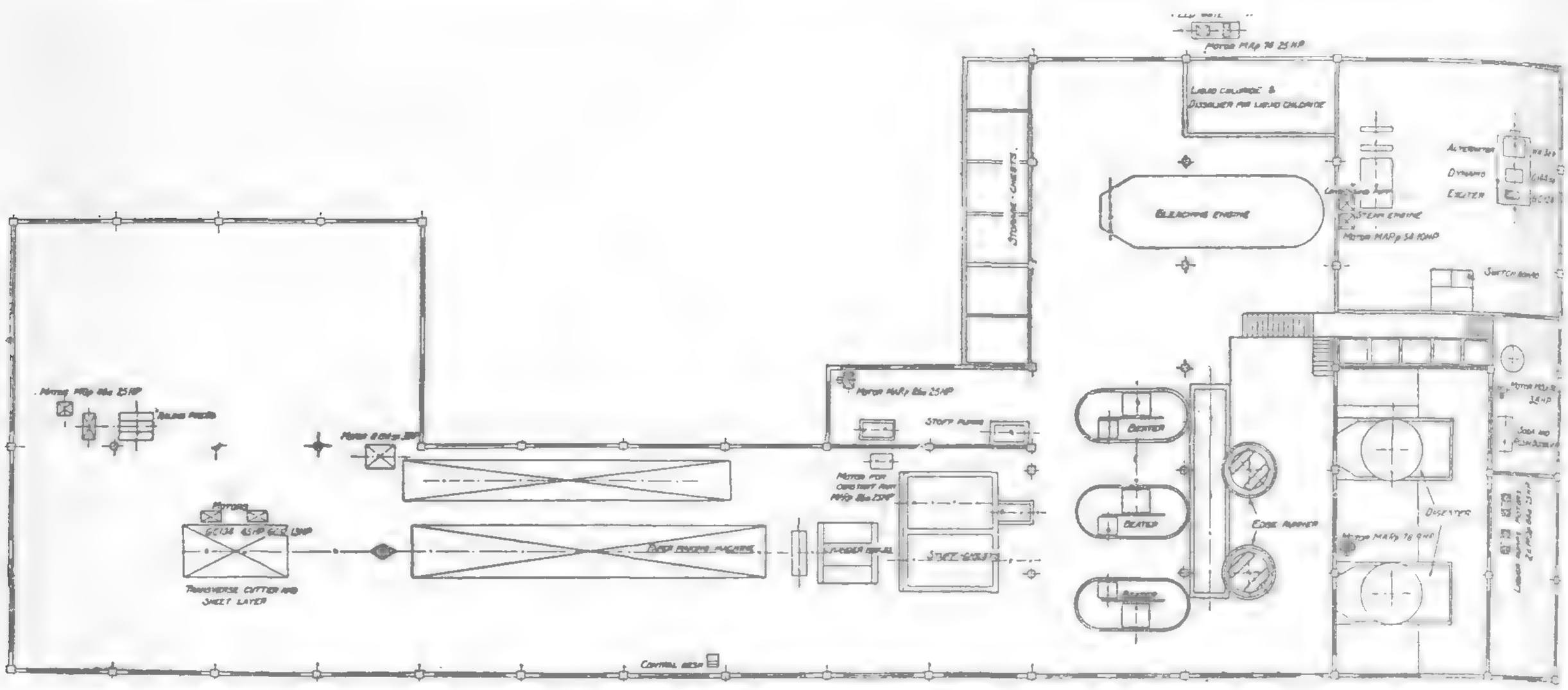
The great demand for paper in this country and the abundant supply of raw material has led to the formation of the Fukien Paper Manufacturing Company, a purely Chinese concern, whose mill is now rapidly nearing completion. The capital of the company is $1,000,000, and the cost of the factory is estimated at $500,000. The factory will confine its output to mainly medium grade writing and printing papers suitable for Chinese use. A general outline of the machinery and process of the paper mill follows :—

Power House

1. Boiler :— a Kablitz overfeed stoker of 5.2 M2 grade, Area under a vertical tube of 130M2 heating surface, working pressure 14 kg.
2. Engine :—Bosing steam engine.
   One vertical enclosed compound Bleeder Steam Engine, jet condenser, with piston valve gear. Hochwald's patent, acted upon by a shaft governor on high pressure and low pressure cylinders. 400 B.H.P.
3. Generator.
   One 194 k.v.a. Brown Boveri three phase generator,
   One 26 kw. Brown Boveri dynamo direct coupled with A.P. generator.
   One 5 kw. Brown Boveri Exciter.



Fukien Paper Mill: Escher Wyss & Co., (Zurich) Paper Making Machine: Left, The Drying End: Right, The Press Part.



General Layout of Fukien Paper Mill

Pulp Preparing Department

1. Raw material Preparing Department.
   A. Chipper, "B" Screen, "C", Elevator.
2. Two spherical revolving boilers (digesters).
3. Two edge runners.
4. Bleaching Engine—35 M 3 capacity.
5. Beater.....5,300 lit. capacity.

Paper Making Machine

1. Paper making machine (mould machine).
   2,200 mm (87 inches) wide.
   35 meters per m.
2. Cutting machine.
3. Paling Press-Hydrolic. (Hydraulic)

These machines were supplied by Escher Wyss & Co., Zurich, Switzerland. The first three shipments have arrived at Foochow and the factory is to be completed by the end of October, 1931. The output of the mill is from 4 to 8 tons of paper per day.

Fukien Paper Mill: Wet end of Escher Wyss Paper Making Machine

Progress in Amoy

(*Continued from page 220*).

memorial to Dr. Sun Yat-sen is also to be built near the park. The Chung Shan Hospital to cost $800,000 is also to be built. Of this, $600,000 was subscribed by the people of Amoy in one month, an evidence of the wealth and generosity of the people for the construction of something really helpful to the general public. A model prison is also projected by the Department of Construction and work is expected to start very soon. In the prison, provisions will be given for the prisoners to learn a useful trade. Seventy thousand of the one hundred thousand dollars required for its construction has been raised. It is expected that the new prison will be completed by the end of 1933.

Mr. S. N. Chow, Director of Public Works and Mr. Homer Ling, Consulting Engineer of the Public Works Department of Amoy signed an agreement last week with the Netherlands Harbor Works Company for the construction of 2,000 lineal feet of bund wall at a cost of $2,200,000, the contract to be completed within two years.

Road Construction in Amoy

Japan's Bid for Transpacific Honors. The Kawanishi No. 12, built for the flight across the Pacific, on its trials. Flying over Inuyama Castle

DAI-KOKU-GUN: THE GREAT AIR FORCE OF JAPAN

Development of Aviation in Japan

By EISABURO KUSANO

TWENTY years ago, on December 19, 1910, an enormous crowd turned out in the suburbs of Tokyo to see Captain Tokugawa, of the Imperial Army, fly a 50-h.p. Gnome-motored biplane for a distance of 3,000 meters. That date marks the beginning of aerial navigation in Japan.

The idea of man's flying in Japan, however, is as old as its 2,600 years of history. Omitting the mythological exploits of heavenly heroes, there are a number of authenticated stories of men being carried up in the air on large paper kites. Among these is that of Yui-Shosetsu, a famous strategist who lived about 250 years ago, who tied himself to a huge kite in order to observe the defences of Edo Castle prior to the unsuccessful launching of his plot to overthrow the Tokugawa régime.

There is also a story of Kokichi, a paper-hanger, who lived in Okayama 130 years ago, who conceived the idea of flying while watching the pigeons at the local Hachiman Shrine, and then built for himself a kind of glider. One Spring day, when he was soaring about on his machine, he spied a crowd holding a feast underneath the blossoming cherry-trees, and descended to see what it was all about. The frightened people ran away, leaving their rinks and food behind. Kokichi did ample justice to the saké and the spread banquet and was later arrested by the hard-hearted police and exiled to a distant island.

Japan Times-Nippon Dempo

Japan's First "Air Service" Girls Go Up for a Ride: A Number of Fair Thrill-Seeking Applicants Go Through a Test, in which Three were chosen as "Air Girls" on Local Passenger Planes

In 1874 a man named Iwata Heisaburo, of Nagano Prefecture, also invented a glider and applied to the authorities for permission to conduct test flights, but his petition was rejected on the ground that "although the idea was praiseworthy, it was a mistake for man to imitate mere birds."

Three years after, during the Seinan Rebellion of 1877, the "imitation of mere birds" was very seriously considered for the first time in Japan. The Government troops

Japan Times-Shimbun Rengo

A Japanese Blimp Brings Down an Endurance Record: The Drigible No. 8 Coming Down to Earth After Being Aloft for Over 60 Hours, Thus Setting a New World's Record for a Semi-Rigid Craft

besieging the rebels at Tawarazaka conceived the idea of using a captive balloon to observe the rebel camp, and an army professor of mathematics was instructed to produce a gas balloon for this purpose; but as the rebels surrendered long before it was completed (a year afterwards), it was never used.

More than ten years elapsed before the next attempt was made to fly. One Chuhachi Ninomiya, of Osaka, a kite enthusiast, produced a model of a bird-shaped aeroplane in 1890. His observations revealed that the hard wing cases of a beetle give it buoyancy, while the soft wings underneath enabled it to fly forward. Based on this principle, he made another model in 1894 which in design was exactly the same as the present-day aeroplanes, with the exception of the propelling device. His efforts, however, failed to interest the public or receive encouragement from the Government.

During the next decade little attention was paid to aviation. Experiments were confined entirely to making balloons. Meanwhile the Russo-Japanese War (1904-1905) broke out. When the protracted siege of Port Arthur commenced, a temporary balloon corps was organized to observe the movements of the Russian fleet hidden within the port. This led to the creation after the war of a regular Army Balloon Corps, with headquarters at Nakano, in the suburbs of Tokyo.

Dawn of Activities in Japan

The first practical step towards developing aviation in Japan was taken in 1909, when the Extraordinary Balloon Commission was organized, under the direction of Lieut.-General Gaishi Nagaoka. Active experiments were carried out during 1910 not only with balloons and airships, but with aeroplanes.

Captain Kumazo Hino, of the Commission, together with Baron Sanji Narahara, then a naval engineer, designed and built an aeroplane in 1910; and although it failed to take off after gliding along the ground, the attempt marked a distinct advance in the development of Japan's aviation. The Government, realizing the importance of military aviation, ordered Captain Hino and Captain Tokugawa to proceed to Europe to complete their studies.

In 1910 Isaburo Yamada, who produced the first Japanese-made balloon in 1903, designed and built the No. 1 Yamada-type airship, and flew over the Capital from Osaki to Meguro. Baron Narahara then produced a biplane equipped with a Gnome 50-h.p. motor. Other aeroplanes, built by Baron Jihiro Iga and Mr. Tetsuichiro Tsuzuki, stimulated public interest in the new science.

Captains Hino and Tokugawa returned to Japan with four planes, one a 24-h.p. monoplane and a Farman 50-h.p. Gnome motored biplane, which were exhibited to the public at Yoyogi, in the suburbs of Tokyo. On December 14, 1910, Captain Hino hopped for about 30 meters while he demonstrated ground gliding. Five days later Captain Tokugawa made the first successful flight in Japan.

The year 1911 opened with the completion of the Army aviation ground at Tokorozawa. Two airplanes, a Bleriot and a Wright, arrived at Tokorozawa, and Captains Hino and Tokugawa conducted a series of test flights. Captain Tokugawa built a biplane based on the Farman model, while Captain Hino succeeded in producing a two-stroke 40-h.p. aero-motor which he installed in his monoplane. Later, Captain Hino severed his relationship with the Tokorozawa group in order to devote his time to the manufacture of aero-motors; Captain Tokugawa remained in the Service as an instructor.

In the meantime a second aeroplane built by Baron Narahara succeeded in flying a distance of 400 meters; Lieut.-Commander Tetsukichi Isobe, of the Imperial Navy, made the first hydroplane in Japan, and an airship having a capacity of 2,930 cubic meters of gas was built. Interest in aviation was further stimulated by the arrival in Japan of the Curtiss agent, who conducted exhibition flights in Tokyo, Osaka, Kyoto, Nagoya and elsewhere.

The following year, 1912, was featured by three important events: the arrival from Germany of the Parsifal airship, equipped with two 150 Maybach motors; opening of the first naval air port at Oppama, near Yokosuka; and the enlistment of volunteers for training as military pilots.

Development During Taisho Era

During the brief but eventful years of the Taisho Era (July 31, 1912, to December 25, 1926) Japan's aviation progress, despite many discouraging set-backs, has, in the main, tended steadily toward greater achievements. Although the Navy and Army have taken the lead, civilian aviation has also made great strides, culminating in the establishment of several privately operated air services, which are now consolidated in the airways of the Japan Air Transport Company.

This 15-year period may be divided into three phases: first, the outburst of enthusiasm created by frequent exhibition flights, followed by a gradual waning of interest; second, revival of civil and military aerial activities in 1918-19; and third, the inauguration of flights by pioneer organizations and the development of the aeroplane manufacturing industry.

On October 21, 1912, or three months after the present Emperor ascended the Throne, the Parsival airship circled above the Capital, followed about a week later by Captain Tokugawa's visit in a Gnome 50-h.p. motored biplane of his own design. These two

flights were the first in Japan, and the people of Tokyo lauded the events just as they did the historic visit of the Graf Zeppelin two years ago.

When the first army review of Taisho was held at Yokorozawa aviation ground the Emperor attended in person to witness exhibition flights by Bleriot, Farman and Tokugawa planes. The Navy also held exhibition flights by seaplanes at the naval review that followed, but these were overshadowed in popular imagination by the 100-mile air cruise made by the Parsifal airship from Tokorozawa to Yokohama to attend the review.

The year 1913 opened with the inauguration of the Imperial Aeronautic Society of Japan, headed by Marquis Hachisuka. The Japan Aerial Navigation Association, formed during 1912 by Lieut.-Commander Isobe, with the support of Viscount Kiyoura, was amalgamated with the new Society.

Towards the end of March, 1913, an aerial demonstration was held with the object of impressing the members of the Diet with the importance of aviation. Unfortunately, the Parsival airship struck the Funeral Hall of the Aoyama Cemetery, Tokyo, and sustained heavy damage, while a Bleriot plane, taking part in the demonstration, had its wing broken on its way back to Kororozawa and crashed near its destination, killing the pilots, Lieutenants Kimura and Tokuda, the first martyrs in the history of Japanese aviation. Another disaster soon followed. Koha Takeishi, who learned to fly in the United States, held an exhibition flight in Kansai with a Curtiss 60-h.p. motored machine brought from America. He took off at Naruo, half-way between Osaka and Kobe, in the presence of a large crowd, visited Osaka, and made a perfect landing. He then hopped off for Kyoto, but on landing at Fukakusa his plane ploughed into the ground and he was killed.

Air Mail Box at Sudacho, Tokyo

These disasters, however, did not diminish public interest in aviation. The Navy and the Army under an intensive course of instruction continued to make marked progress. Notable among their achievements was the 120-mile circular flight by Lieutenant Sawada, of the Army, in a Morris-Farman plane equipped with a Renault 70-h.p. motor. Lieutenant Kaneko, of the Navy, attained an altitude of 1,000 meters in a Farman seaplane. During the annual military manœuvres held near Nagoya the same year (1913) four Morris-Farman planes and two Tokugawa planes participated in the mimic battle for the first time in Japan, the planes being divided into two opposing groups.

The outbreak of the European War in August 1914 provided Japanese military aviators with their first opportunity to show what they could do in active service. More than a dozen military and naval airplanes took part in the siege of Tsingtao, fighting the first air battle in the Far East with a German monoplane. The naval planes alone flew for 70 hours and 2,000 nautical miles during the siege, and all the machines returned home safe in November.

Just prior to the outbreak of the War a grand air meet was held at Naruo on June 13 and 14, under the auspices of the Imperial Aeronautic Society, in which several flyers who had returned from Germany, the United States, and France took part. More than 100,000 people turned out to witness the two-day program, which consisted of visiting neighbouring cities, soaring to high altitudes, and performing stunts. The meet was such a success that the participants were later invited to exhibit their skill in other large cities of the Empire. The mere act of flying was marvelled at in those days, and anyone who could handle a plane became a popular hero.

The difficulty of obtaining new aero-motors from abroad characterized the year 1915, and exhibition flights no longer drew large crowds. When the second air meet was held at Naruo in December of that year only 8,000 people attended. Public enthusiasm had apparently fizzled out, and several civilian flyers had to seek other employment, while many others went abroad.

The Army and Navy, however, kept advancing. A round trip between Tokorozawa and Osaka was accomplished for the first time by the Army pilots, while the Navy flew ten consecutive hours around Tokyo Bay, and also set a record for long-distance flying of 190 miles in a 100-h.p. Farman seaplane. Moreover, the Navy conducted various experiments with tractor-biplanes equipped with 100-h.p. motors. The Army completed the Yuhigo airship, and organized the first air battalion towards the end of this year.

The creation of a home source of supply by erecting factories for turning out aeroplanes, motors and accessories was forced upon Japan by the War. Tsunejiro Obata, of Kyoto, and Dr. Itta Kishi, professor of the Imperial University of Tokyo, were prominent in these initial activities, while Tsuzuki manufactured a monoplane for delivery to China.

The year 1916 marked the opening of a transitory period during which Japan's military, naval, and civilian aviation was re-established on a small but firmer basis. The Army's new airship Yuhigo flew from Tokorozawa to Osaka after surmounting various difficulties, but had to be dismantled due to encountering a storm.

When Japan's aviation was passing through a period of inactivity there came from the United States a flyer named Niles, followed shortly afterwards by Art Smith, who exhibited spectacular stunts, such as looping the loop, the roll, and the falling leaf, utterly overwhelming the Japanese aviators and making a profound impression on the public.

The Imperial Aeronautic Society then held the first contest between aero-motor manufacturers. Of the 22 motors entered

Loading Mail on a Tri-Motored Eight-Seater Fokker (F. VII) of the Japan Air Transport Company

Inside of Eight-Seater Fokker of the Japan Air Transport Company's Fleet

only six were tested, and one Gnome et Rhone 80-h.p. motor, produced by Yuzo Shimazu, alone stood the four-hour test, winning a prize of Y.10,000. Other motors went out of order after about one hour's operation.

The short-lived enthusiasm for aviation, with Naruo as its centre, having disappeared, the sea-coast of Anamori, near Tokyo, and Inage, of Chiba Prefecture, were chosen as centres of activity for civilian flyers, but the aviation grounds were destroyed by heavy tidal waves in September of the same year.

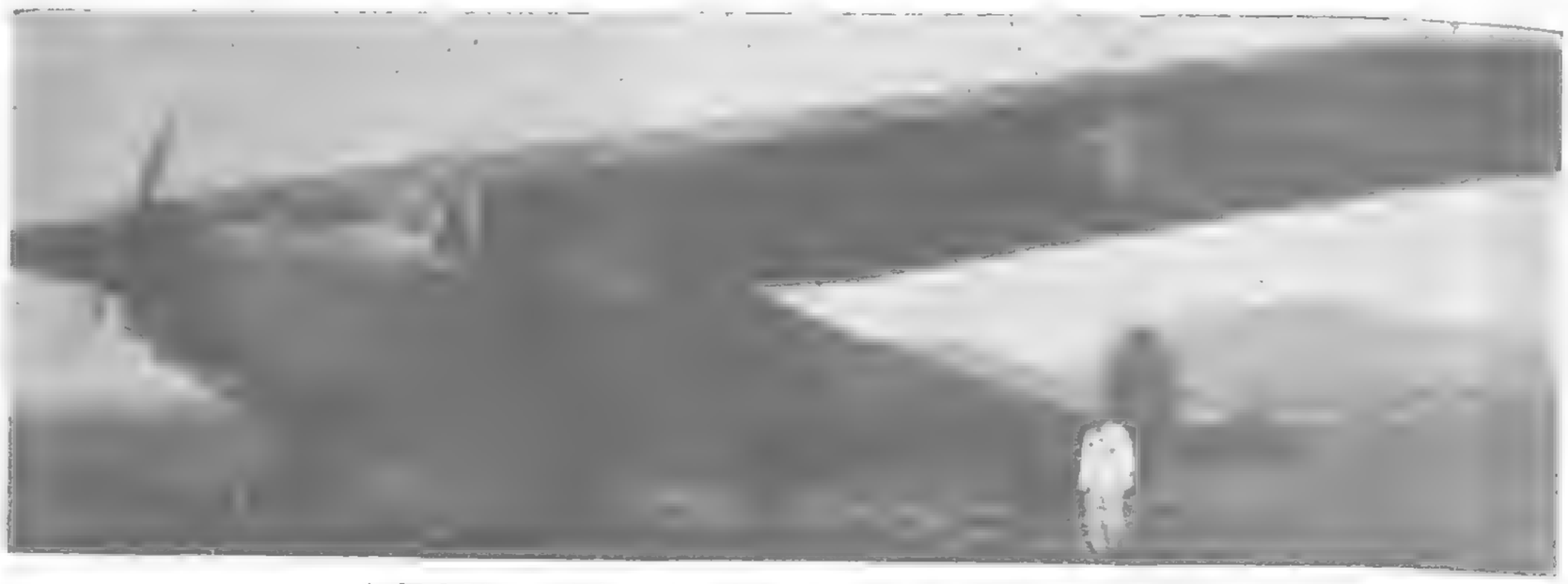
In 1917 Katherine Stinson and Art Smith arrived from the United States, holding many successful exhibition flights throughout the country, but it was another bad year as far as Japanese aviators were concerned. Accidents occurred one after another, taking a number of lives, including that of the talented pilot, Lieutenant Nagasawa, who was killed while trying out a Curtiss type pursuit plane. At the end of this year the Kagamigahara aviation ground was opened.

The streak of bad luck that characterized the year 1917 continued until the early part of 1918. In March 1918, however, Lieutenants Makabe and Nagao, of the Army, who had just returned from France, showed remarkable skill in piloting Spad and Nieuport planes. Trial flights of other speedy planes by different Army pilots followed, indicating that the era of crack flying had dawned.

War clouds were then gathering over Siberia. Mr. Kamesaburo Yamashita's donation enabled the Army to buy new machines, and the Air Corps joined Japan's Siberian expedition. The Navy about this time adopted the Yokosuka tractor-planes equipped with Benz 100-h.p. motors as standard, while the Imperial University of Tokyo opened a research laboratory at Etchujima, Tokyo. Chikuhei Nakajima, of the Navy, retired from active service and opened the Nakajima airplane works, while Dr. Kishi opened aviation grounds at Akabane, and Mr. Otojiro another field at Tsudachi.

Masao Goto, piloting a Morris-Farman plane equipped with a Renault 70-h.p. motor, made the first non-stop flight in six hours and a half between Tokorozawa and Osaka. He then hopped off for Uwajima, on Shikoku, where he was relieved by Yozo Sato, who flew back to Tokorozawa, via Okayama and Toyohashi, a total distance of 1,200 miles. This first long-distance flight was made under the auspices of the Imperial Aeronautic Society. Shortly after, the Society absorbed the National Aviation Society, and a special Imperial subsidy of Y.500,000 was granted to the enlarged organization. During this year the Kawasaki Dockyard Company started the construction of airplanes, and Dr. Kishi's enterprise was incorporated into a company capitalized at Y.500,000.

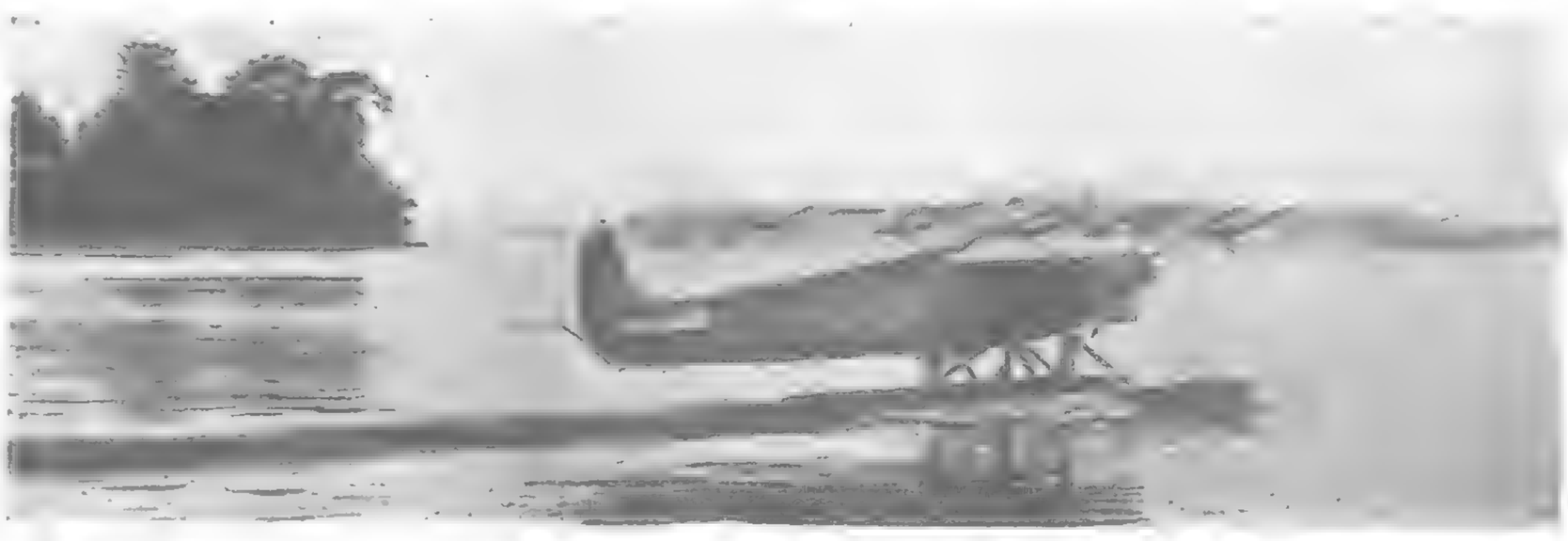
The arrival from France of an Aviation Mission, headed by Major-General J. P. Faure, then a Captain, as well as



A Tri-Motor Plane arriving at Dairen from Tokyo

Fokker F.VII 6-Type 8-Passenger Plane; Three Wright VI Motors of 225 h.p. each, consuming 189 liters of fuel per hour

Fokker Super Universal Six-Seater; one 420-h.p. Motor



Fokker Super Universal Six-Seater, built in the United States, gliding on the waters of the Najima Air Port, near Fukuoka

Fokker Super Universal Six-Seater Seaplane taking off at Beppu Bay. Built in the U.S.A.; Jupiter 420-h.p. Motor

the general revival of civilian flying, characterized the year 1919. The instructors were divided into a number of groups and assigned to various schools: one group teaching piloting to the Kagamigahara air corps; another group was attached to the Shimoshizu air corps, while still another group instructed the Mikatagahara air corps in bombing; instruction in balloon operations and airplane construction was carried on at Tokorozawa; and the manufacture of motors at the Atsuta arsenal. One group was also assigned as instructors to the Navy Department. During the eight months that followed these French experts taught the Japanese Army and Navy flyers all that they had learned during the European War. They brought with them the most up-to-date and speedy planes of the Breguet, Salmson, Nieuport and Spad types. As a result the Japanese Army's Flying Corps underwent a complete transformation. The Navy did not remain idle; the Yokosuka Navy Yard succeeded in producing a 200-h.p. machine, which made a successful trial flight between Kure and Sakai (near Osaka) across the Inland Sea. Civilian aviation also profited from this instruction.

When the 50th anniversary of the removal of the Capital from Kyoto to Tokyo was celebrated in May, 1919, the Akabane, Nakajima, and Ito aviation groups participated in the event. Among others, Toyotaro Yamagata, of the last-mentioned body, performed the first loop-the-loop by a Japanese flyer, piloting a Gnome 50-h.p. motored machine in a strong wind.

The Imperial Aeronautic Society then began advocating the establishment of a Tokyo-Osaka air mail service. The first trial flight took place on October 22, 1919, when Yozo Sato, of the Nakajima Aviation Ground, completed the round trip in 6 hours and 40 minutes, followed by Yamagata of the Ito Aviation Ground, and Lieutenant Mizuta, of the Nakajima Aviation Ground. The last-mentioned flyer on his return trip covered the distance in 2 hours and 10 minutes, establishing a new record.

The following year, 1920, was also eventful. Notable features were the Army's 1,550-kilometer flight from Tokorozawa to Keijo (Seoul) in March, using a Salmson and subsequently a Soppiece plane; the Navy carried out an 840 nautical mile flight from Oppama to Sasebo, viâ Kure, Beppu and Chinkai, with three Yokosuka "Ra" type Hispano-Suiza 200-h.p. planes. Two planes, flown by Sub-Lieutenants Akashiba and Akaishi, completed a non-stop flight from Sasebo to Oppama, flying for 11 hours and a half along the Inland Sea and off the Kishu coast.

To match the flights of the Army and the Navy, the Imperial Aeronautical Society announced a prize non-stop Tokyo-Osaka round trip flight for a distance of 630 miles. Two flyers, Toyotaro Yamagata and Kintaro Iinuma, took part, the former being the victor, flying for 6 hours and 40 minutes, piloting a 150-h.p. motored Ito type "Emi" plane. Iinuma made a forced landing in the neighbourhood of the Hakone mountain range and was severely injured.

In 1920 Japan signed the International Aerial Navigation Treaty; the Tokorozawa Aviation School was opened, and the Army added two more air battalions at Yokaichi and Tachiarai, while the Navy completed a gigantic aviation field at Lake Kasumigaura. In August the first civilian flyers' grand air meet was held at Susaki, Tokyo, under the auspices of the Imperial Aeronautic Society, participated in by nine aviators, including a Formosan. Yukichi Goto attained an altitude of 5,000 meters, piloting an Ito type "Fuji" plane equipped with a Rhone 100-h.p. motor. The talented young flyer, Toyotaro Yamagata, was killed soon afterwards in the city of Chiba while attempting to loop the loop.

For the purpose of protecting and encouraging civilian aviation in Japan, the Army organized the Aviation Board, headed by General Yamanashi, the then War Minister, to co-ordinate the military, naval and civilian activities.

On October 22 a second mail flight, participated in by four flyers, was conducted between Osaka and Kurume, under the auspices of the Imperial Society. Shoha Ishibashi's Spad plane covered the distance in 3 hours and 7 minutes and won the prize.

Toward the end of the year Sergeant Kamata, of the Akenogahara Aviation Ground, established an altitude record of 3,880 meters with a Morris-Farman plane.

The airplane manufacturing industry was also making great progress. The Mitsubishi Works at Nagoya and the Aichi Clock & Electric Machinery Co., also at Nagoya, began manufacturing on a large scale. Meanwhile the Nakajima aviation ground severed relationship with Kawanishi and extended its enterprise, while Kawanishi opened an airplane works in Kobe.

During 1921 aviation was utilized for commercial purposes for the first time in Japan. When H.M. the Emperor, then H.I.H. the Crown Prince, returned from his European tour in September of that year, the Shochiku Kinema Company's film of his trip was transported by air from Moji to Osaka and the picture shown to the public the same night. The Aviation Board established the system of classifying civil aviators, as well as their airplanes, under three heads: first, second, and third classes, and A, B, and C grades respectively.

The first group of eleven civil flyers attached to the Army for training graduated in September. These have been followed by many others since that time.

The second civilian flyers' air contest was held at Susaki, Tokyo, for five days beginning May 12, under the auspices of the Société Imperiale d'Aeronautique du Japan, and all the participating airplanes carried insignia showing their grades, in accordance with the new regulation. The Society next held a prize mail-carrying contest between Tokyo and Morioka in August of the same year. This event was participated in by only five aviators, as six airplanes had been destroyed by a fire that broke out at the Nakajima aviation ground on the eve of the contest. Of the five competitors only three completed the outgoing trip, due to dense fog. The return trip was abandoned. Undaunted by this failure, however, the Society held another air mail carrying contest between Kanazawa and Hiroshima in November, 1921. The weather was rough, but six flyers started, and two succeeded in covering the entire distance of 580 kilometers.

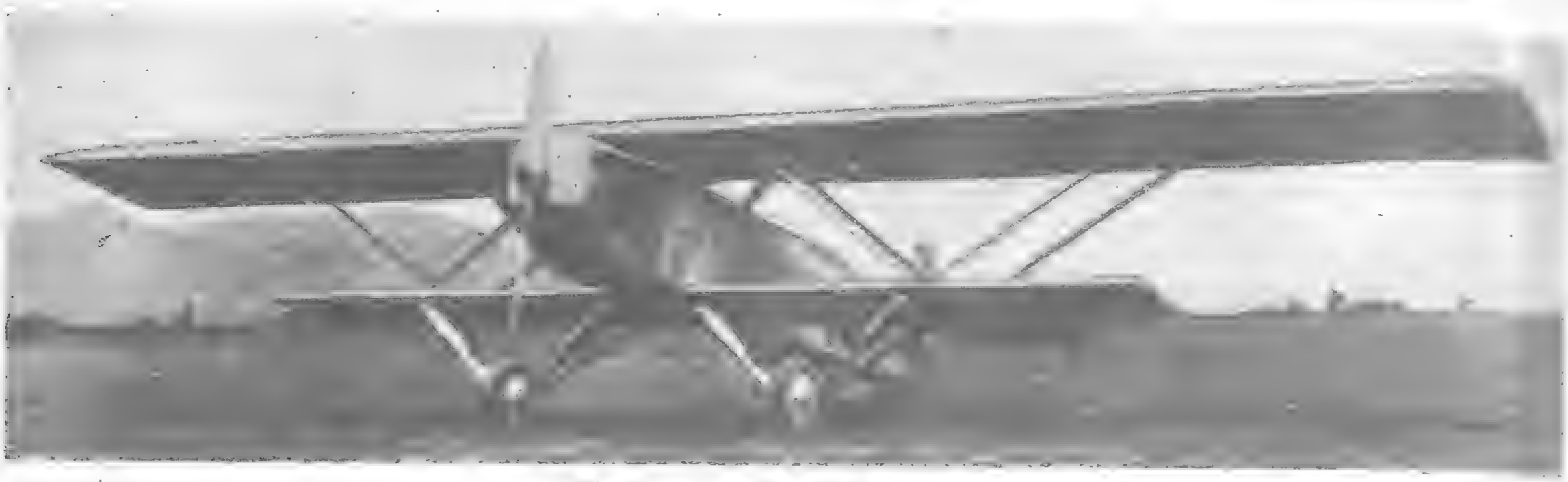
The Army air battalions manifested remarkable activity during 1921; and while a few serious accidents occurred, several records were established. Among other things, Lieutenant Kanzo Ozeki made 450 loops in one hour and 40 minutes, followed soon afterwards by Lieutenant Kawaida's 450 loops. Air manœuvres of various kinds were conducted, during which Lieutenant Tayama established a record of hitting percentage of 39 per cent in streamer shooting. The Tokorozawa Aviation School was also active. Two flyers, Higuchi and Eda, completed a 1,200-kilometer non-stop flight between Tokorozawa and Asahigawa (Hokkaido) in six hours and a half in June, while four Army pilots accomplished the first Japan to China flight in October.

Lieutenant Higuchi flew from Tokorozawa to Tachiarai on the first day of the Japan-China flight, piloting a Salmson plane equipped with a Salmson 230-h.p. motor; thence to Keijo across the channel several days afterwards, making the last lap to Changchun, with but one stop at Shingishu, and covering the entire distance of 2,600 kilometers in 16 hours and 45 minutes. Sergeant Ozawa, of the group, after taking off from Tachiarai, lost his way at sea because of fog, and eventually arrived at the old mouth of the Yellow River in Kiangsu Province, China. The incident attracted much attention in China in those days.

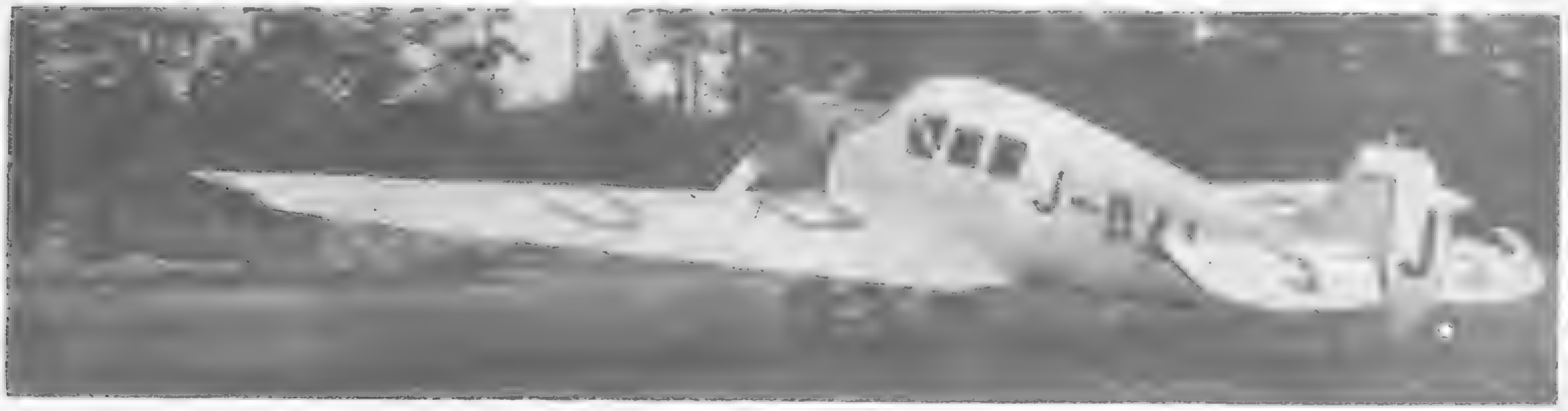
Having gained confidence in these flights, the Army air authorities then staged the most brilliant air display so far in the form of a sham attack on Tokyo. Nieuport and Spad fighters, Salmson and Farman scout-planes, and Farman-Goliath bombers, in all more than 60 airplanes, were engaged in the historic air battle, staging night attacks on the Capital. On the last day of the manœuvres 42 planes carried out an impressive air review above Tokyo.

In the meantime, the Department of Education created the Aerial Navigation Council to aid in solving various technical problems of aeronautics, while the Navy carried out a wholesale reorganization of its air forces. Notable among these changes were: an air corps was attacked to each naval base; a training-school was opened at the Kasumigaura aviation field, and a number of new airplanes were purchased. The Navy conducted a number of long-distance flights, and the F-5 flying boat was built by the Aichi Company. The arrival from England of a party of naval instructors at this time marked a new epoch in the development of naval aviation in Japan.

The remarkable improvement of the Japanese Imperial Navy's Air Corps, resulting from the visit of the British instructors, headed by Baron Semphill, was the feature of 1922. A party of more than 20 British naval airmen took up the training of the Japanese flyers in various branches of aviation, including taking off from and landing on warships, parachute handling, air-photography, motor and body construction, etc. They used the latest types of the Avro Super-Hawk and Panalpansa land planes, Aichi, F-5, Super-



The Mitsubishi "Eagle" Day-Bomber



Mitsubishi F.13 Passenger Plane, equipped with 380-h.p. Motor

Full length, 10.945 meters ; full width, 14.750 meters ; full height, 3.800 meters. Weight fully equipped, 2,600 kilograms ; light, 1,550 kilograms : effective burden, 1,050 kilograms ; including a pilot and a mechanic, 140 kilograms : 4 passengers, 280 kilograms ; freight, 310 kilograms ; and fuel, 320 kilograms. Full speed, 180 kilometers ; economic speed, 160 kilometers : landing speed, 80 kilometers ; and duration of navigation, six hours.

marine ; Vickers flying boats, Blackburn and Soppice bombers. One of the striking performances during the training period was when Lieutenants Senda and Sakamaki, under the guidance of Lieutenant-Commander Blackley, accomplished a 4,400 nautical mile flight from Yokosuka to Kure and Sasebo, and back to Yokosuka, piloting an F-5 flying boat.

The Kasumigaura aviation field, which covers 750 acres, then became an independent air corps simultaneous with the independence of the Sasebo, Yokosuka, and Omura naval air corps. The aircraft carrier Hosho, 9,400 tons, was also completed.

Side by side with the considerable progress made by the naval flyers in the art of aviation, the airplane manufacturers also held their own. The Mitsubishi's 10-type (*junen-shiki*), the Aichi Clock & Electric Machinery Company's F-5 flying boat, and the Makajima's Hansa monoplane marked a new phase of development in the history of Japan's airplane manufacturing industry.

The Army, too, renamed the Nieuport, Salmson, Spad, and Farman-Goliath as the "Ko," "Otsu," "Hei," and "Tei" types, the English equivalent of these names being "A," "B," "C," and "D." Air battalion headquarters of the 1st and 2nd Battalions were established at Kagamigahara, near Nagoya; the 3rd Battalion at Yokkaichi ; the 4th Battalion at Tachiarai; and the 5th Battalion at Tachikawa. In June 1922 the Army opened a regular military air mail service between Tokorozawa and Kagamigahara, between Kagamigahara and Tachiarai, and between Yokaichi, Kagamigahara, and Akenogahara. This was maintained until March of the following year. The progress made by the Army and the Navy was not without accidents and a number of deaths, but the percentage of the casualties was remarkably small.

Civilian aviation circles were also animated throughout the year 1922. The inauguration by Choichi Inoue, of Tokushima, of a regular air mail service between Osaka and Shikoku Island was an outstanding achievement. Mr. Inoue studied flying at the Ito aviation field of Tsudanuma, and afterwards established the Japan Air Transport Research Laboratory (Nihon Koku Yuso Kenkyu-jo) on the sea-coast at Sakai city, near Osaka, in June, and started an air-mail service between Osaka, Takamatsu, and

Tokushima, operating twice a week with ten Yokosuka Arsenal type planes, each equipped with a Benz 100-h.p. motor. The machines were purchased from the Army.

In July of the same year Mr. Kawanishi, of Kobe, opened the Japan Air Transport Research Society (Nihon Koku Yuso Kenkyu-kai) at Shibaura, Tokyo, to conduct a regular flight with one Curtiss flying-boat purchased from the Sale & Frazar Company. Unfortunately, however, the machine was damaged soon afterwards.

Whipped into action by these successes of private aviators, the Société Imperial d'Aeronautique du Japon conducted a temporary air-mail service between Tokyo and Osaka for a week beginning November 3. There were a few forced landings, but the tests were carried out successfully.

The Aviation Board in the meantime carried on its campaign for better airplanes, while the Census Board offered prizes to encourage the manufacture of Japan-made aero-motors. Flyer Yoshimura's aviation field was then established in Sendai city.

In January 1923 the "Osaka Asahi" organized the East-West Regular Aviation Society (Tozai Teiki Koku-kai) in order to inaugurate the Tokyo-Osaka regular air-mail service in co-operation with the Ito and Shirato aviation fields. This service was maintained until the end of March of the same year. Defying severe winter winds, the airmen made flights totalling 96 hours, covering a distance of 10,000 kilometers during the eleven weeks.

Mr. Inoue's Osaka-Shikoku Island air-mail service in the meantime was carried on regularly. Mr. Kawanishi, of Kobe, established an airport at the mouth of the Kizugawa (river), Osaka, in July 1922, and opened the Osaka-Beppu air service, using the Yokosuka Arsenal type planes.

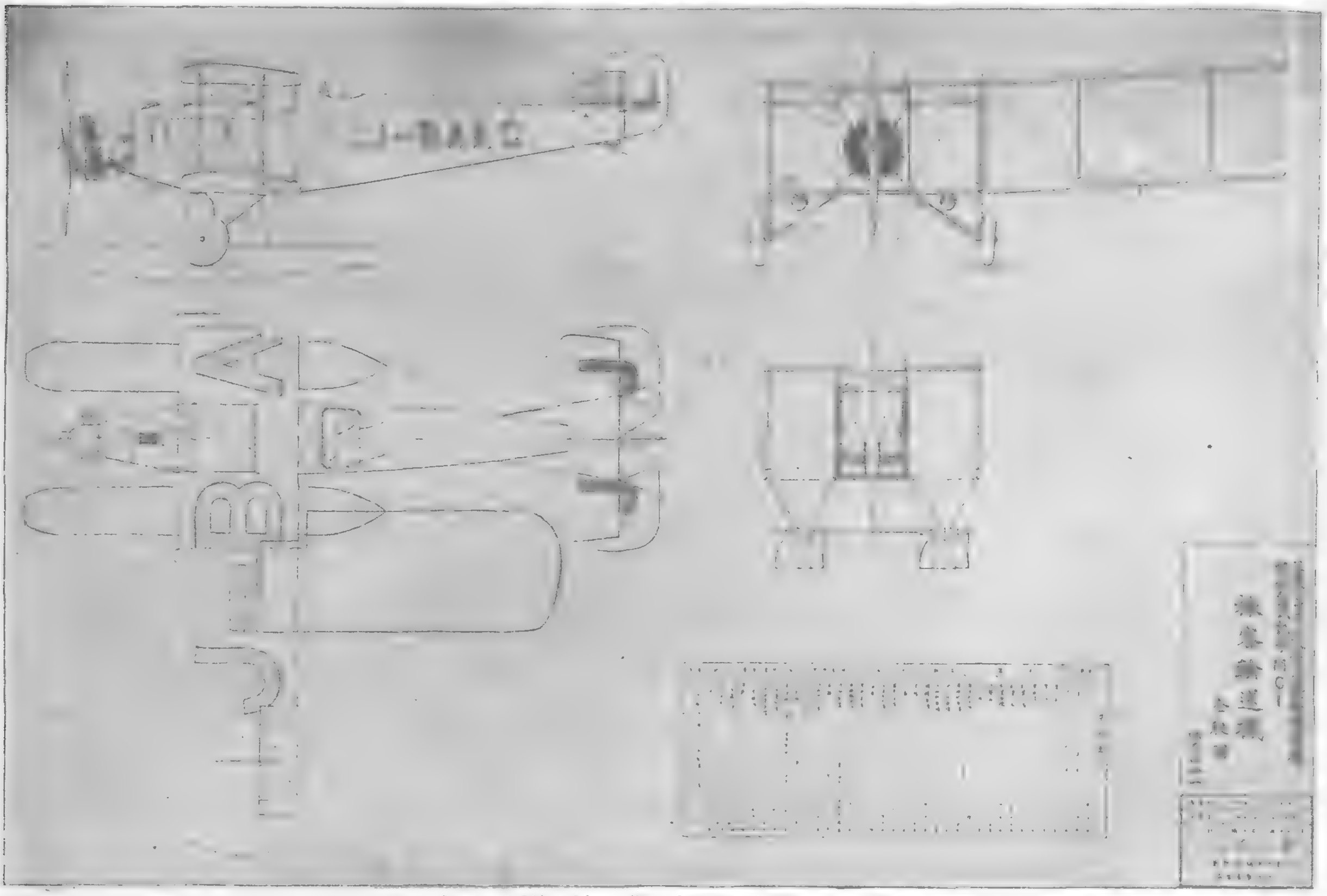
During this period the Army created a new air corps for Heijo, Chosen, while the Navy conducted frequent long-distance flights over the sea. The S.S. airship was remodelled and made frequent visits to Tokyo. During this year the Central Meteorological Observatory also started to issue special weather reports in the interests of aviation, while the airplane manufacturing industry in Nagoya went on making further development, especially at the Mitsubishi plant.

Another important event was that the Aviation Board was transferred from the Army to the Department of Communications during this year in order that civilian aviators as well as air enterprises might be better protected and encouraged. The Société Imperial held another grand air meet at Shimoshizu in June of this year.

An opportunity for aviation to be utilized to its utmost advantage was offered when the great seismic calamity occurred in the Tokyo-Yokohama district on September 1. It is remembered that the cities of Tokyo and Yokohama, especially the latter, as well as many neighbouring cities, towns, and villages, were violently shaken, resulting in enormous casualties. All the means of traffic and communications having been destroyed by the earthquake and the subsequent conflagration, the Army airplanes displayed remarkable activities in all directions. With the Yoyogi parade-ground, Tokyo, as a centre, the military planes alone flew a distance of 55,000 kilometers during the three weeks following the disaster, conveying military messages to and fro in connection with the maintenance of peace and order in the Capital, and frequently transporting 'quake sufferers' private communications from Tokyo to Kagamigahara and Osaka. The naval planes were also active,

Mitsubishi Eagle (M.C.I.) Light Fighting Plane equipped with a 450 h.p. Motor

Full length, 9.850 meters full width, 20.120 meters full height, 3.500 meters; weight, fully equipped, 3,700 kilograms, light, 2,100 kilograms; burden, 1,600 kilograms. Armament: two fixed machine-guns, one revolving machine-gun, one downward shooting machine-gun, and bombs weighing 600 kilograms. Speed: At 1,000 meters altitude, 211 kilometers per hour; at 2,000 meters, 204 kilometers; at 3,000 meters, 198 kilometers per hour.



Drawings of Mitsubishi "Eagle" Light Fighting Plane

establishing temporary headquarters at Shibaura, on the water-front of Tokyo.

The Kawanishi airplanes flew from Osaka to Tokyo on September 2, carrying newspapermen of the "Osaka Mainichi" and the "Osaka Asahi" (which was a big event in those days), and were then engaged in the air-mail service between Shibaura and the port of Shimizu. Other civilian aviators likewise rose to the occasion.

After the earthquake, however, the Shirato and Oguri aviation fields had to be closed down, and the Ito aviation field, too, suffered badly. Commercial aviation alone remained active, with Osaka as its centre.

The Tozai Teiki Koku-kai renewed its activity in 1924, when the "Osaka Mainichi" opened an aviation department in competition with the "Osaka Asahi." These two newspapers contributed largely to the speeding-up of aerial communications. In July the "Osaka Mainichi" accomplished a round-the-Empire flight of 4,360 kilometers, covering the distance within 33 hours and 52 minutes between July 22 and July 31. The flight was started at Osaka and wound up at Yokkaichi, after visiting Kagoshima, Fukuoka, Kanazawa, Akita, Minato, and Kasumigaura. The seaplane used n this flight was the Kawanishi 6-type Maybach 240-h.p. motored plane.

With the exception of occasional flights of short distances, nothing else worth mentioning took place in civilian circles. The Army remained inactive, but the Navy was busy accomplishing a number of big flights. Notable among the air accidents of the year was the explosion in March of the S.S. airship, which resulted in the death of six members of the crew.

The year 1925 was the most eventful of all in Japanese aviation. The Navy held a number of successful long-distance flights, operating F-5 flying boats, 13 type fighters, an amphibian plane equipped with a Napier-Lion 450-h.p. motor, and other craft, while the Army, in addition to several long-distance flights, carried out another wholesale reorganization. In the first place, the Air Force was made an independent branch of the Army on May 5. Then the six-year program of increasing the Air Force by ten air companies was completed, and all air battalions were elevated to the status of air regiments. Moreover, an air bombing regiment was created at Hamamatsu, the 8th Air Regiment was established in Taiwan, and an anti-aircraft artillery corps was organized. In celebration of the Air Force's independence and subsequent changes, various air manœuvres were then conducted.

Mention must also be made of the fact that the type of aircraft hitherto known as the Yokosuka Arsenal type went out of military and naval use after November 1925, both the Navy and the Army having been provided with better planes of domestic and foreign design.

Civilian circles also had a busy year. The first air pageant in Japan was held in Tokyo in March under the auspices of the "Kokumin Shimbun," an influential Tokyo daily paper. The event was participated in by more than 50 civilian, military and naval airplanes. Another big air meet was held in Tokyo under the auspices of the "Yamato Shimbun," also aTokyo daily,in commemoration of the tenth anniversary of the death of Lieutenants Kimura and Tokuda, the first air martyrs of the Empire. Meanwhile, private aviation schools, like the Nihon, Dai-ichi, Mazume, and Toa, as well as the Mikuni Aviation School, the last under the management of H.I.H. Prince Yamashina, enjoyed prosperity. (It is remembered that Prince Yamashina learned flying in the naval air corps in 1921.)

The Sakai aviation field, near Osaka, was totally destroyed in March by a heavy storm, but was re-established shortly afterwards. The Tozai Teiki Koku-kai, of the "Osaka Asahi," opened an air mail service between Tokyo and Osaka on April 20, operating Salmon airplanes ; the Nihon Koku-kai, of Mr. Kawanishi, inaugurated an air mail service between Osaka and Fukuoka with Kawanishi 7-type hydroplanes ; and the Sakai aviation field started an air-mail service between Osaka, Takamatsu, and Imabaru, using Hansa monoplanes and Yokosuka Arsenal type planes. In the meantime preparations were being made for the historic air trip to Europe sponsored by the "Osaka Asahi."

On July 20, 1925, Captain Ko Abe and First-class Pilot Kazuhiko Kawachi, each accompanied by one mechanic, set out on the 16,500-kilometre flight to Rome, via Siberia and various European

Mitsubishi Passenger Plane equipped with a 310-h.p. Motor

Full length, 9.50 meters; full width, 17.75 meters; full height, 3.20 meters. Weight, fully equipped, 2,300 kilograms; light, 1,280 kilograms; burden, 1,020 kilograms; one pilot, one mechanic and four passengers. Full speed, 192 kilometers per hour; economic speed, 160 kilometers; and duration of navigation, 8 hours. Remark:—This machine can be used as both seaplane and land-plane.

countries. They each piloted a Brequet 19-type plane, both equipped with a Lorraine-Dietrich 400-h.p. motor. They arrived at Moscow on August 23, flying thence to Berlin and Paris. They left Paris on October 12, arriving at Rome on October 27, visiting, on their way, London, Brussels and Lyons. The total flying hours were 112.

The following year, 1926, being the last year of the Taisho era, mourning for the Emperor was announced on December 25. During this last year of Taisho, however, Japan finally caught up with world progress in aviation.

A 1,200-kilometer flight from Tachikawa to Kagoshima without a single landing made a good start for the Army, which held a number of 1,000-kilometer flights at various places. But the Army's main attention was concentrated on the improvement of aircraft rather than record-making flights. Subsequently various military improvements were introduced in the "Ko" and "Otsu" type machines, and in addition the Kawasaki's all-metal B.M.W. 200-h.p. plane was adopted as a heavy bombing craft in place of the "Goliath" types. The Navy, on the other hand, carried out several record-breaking flights. Lieutenant Susumi, among others, flew to Shanghai, via Tsingtao, in May, and on his way back hopped the distance between Shanghai and Sasebo in eight hours. He piloted an F-5 flying-boat. Furthermore, two F-5 flying-boats of Yokosuka made a round trip to Gensan (Chosen), opposite the Main Island across the Japan Sea, covering a distance of 1,700 nautical miles. It was generally recognized then that the Army had something to learn from the Navy in points of flying over the sea as well as in the construction of Japan-made airplanes. Added to the Naval Air Force were the Astra and N-3 airships, besides the S.S. airship, the first two being used for training purposes. Furthermore, the Navy drew up a plan for a rigid airship. The Hiro Naval Air Corps was allowed to become independent, and the aircraft carriers Akagi and Notoro were completed.

Mr. Kiyoichi Nakajima, President of the Nakajima Aircraft Works

In civilian aviation circles the air-mail service showed 73 per cent practicability. The then three operating lines covered a distance of 139,000 miles. Of these lines, the Tozai route was extended to Sendai, the Fukuoka line to Dairen, and the Imabaru line to Oita. In September Flyers Inui and Nambu, of the Nihon Koku Kaisha (of the Kawanishi), flew to Dairen, operating a Kawanishi 10-type passenger plane. In October Flyers Abe and Fujimoto of the same company hopped to Shanghai on a Kawanishi 7-type seaplane. Fujimoto's plane made a forced landing on the sea, but was rescued by a passing steamer. Nevertheless, the results of these test flights warranted the long-awaited opening of the commercial line to Shanghai.

Tokyo Plant of the Nakajima Aircraft Works
Front View

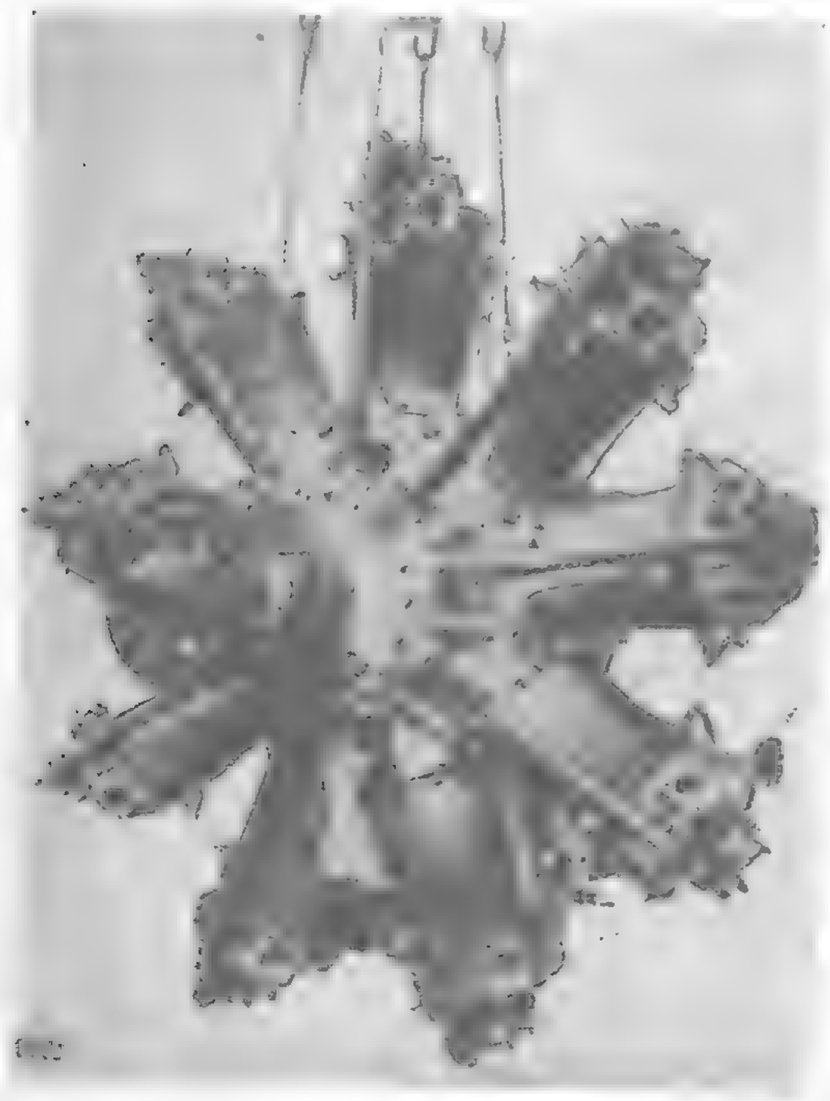
Rear View

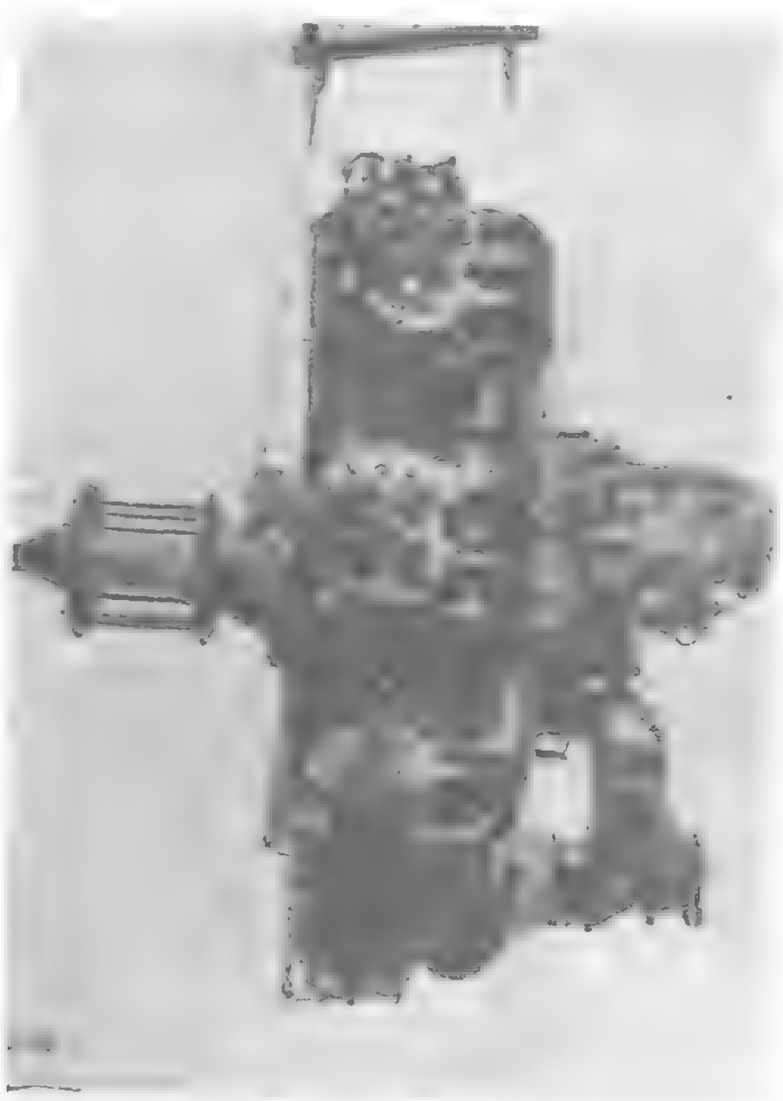
The movement of promoting an air transport company, too, made steady progress during that year, and an appropriation for the establishment of airways was passed by the Diet. The civilian airplane manufacturing industry also made further development. Among the products of other companies, the Mitsubishi "Tiger" aero-motor passed successfully all tests. In the course of the test flight, Flyer Nakao covered the distance of 1,500 kilometers between Omura and Morioka in 8 hours and 21 minutes, non-stop. Local aviation schools were also active. The second air pageant was held at Yoyogi in April, while in October an air display was held under the auspices of the Société Imperiale, participated in by more than 60 airplanes, including the naval and military machines.

The 15 years under the Emperor Taisho thus witnessed a healthy growth of aviation in the Empire in all directions.

Aviation in Japan To-day

There was a time when a man could make a fortune if he could fly only a few hundred metres. There came a more advanced stage when a flyer had to loop the loop to draw crowds. But gone are the days when flying was a novelty. It has now become a practical means of traffic, and it is even said sometimes that flying is safer than any other means of transportation, in view of the fact that the Japan Air Transport Company covered 1,079,352 miles in 1930 without a single mishap. Moreover, the company's craft soars





The "Nakajima" Jupiter Series VI. Engine
Front View — Side View — Rear View

LEADING PARTICULARS—Standard Service Engine.

Type	9 cylinder air-cooled radial.
Bore	5.75″ 146 m/m.
Stroke	7.5″ 190 m/m.
Total Swept Volume	1,753 cu. ins. 28.7 litres.
Normal Speed	1,700 R.P.M.
Power at Normal Speed	450 B.H.P.
Max. Speed (not exceeding 5 mins.)	1,870 R.P.M.
Power at Maximum Speed	485 B.H.P.
Propeller	Direct drive L.H. tractor.
Engine Rotates	Clockwise looking on front.
Cylinder Numbers	1, 2, 3, 4, etc. clockwise looking on front—No. 1 cylinder vertical.
Firing Order	1, 3, 5, 7, 9, 2, 4, 6, 8.
Carburettor	1 Bristol triplex.
Mixture Control	Variable jet.
Ignition	Dual 2 B.T.H. type S.C. 9 magnetos.
Ignition Control	Fixed 42°F.
Sparking Plugs	2 per cylinder, K.L.G. F.12.
Lubrication System	Pressure 40 lbs. sq. inch.
Oil Pump	Duplex Gear, 1 scavenger, 1 feed.
Oil Circulation	50 gallons per hour.
Tachometer Drive	½ Engine R.P.M.
Fuel recommended	80% Aviation petrol and 20% benzol.
Oil	Castrol "R" or pure treated pharmaceutical castor.
Rated Consumption per hour at normal R.P.M.	
Fuel	29 gallons.
Oil	1.25 gallons.
Standard Weight, dry	730 lbs.

across the Chosen channel even on days when the Fusan-Shimonoseki ferry steamers are obliged to remain in port. These developments have been mainly accomplished in the course of the first five years of the Showa era, which opened on December 26, 1926.

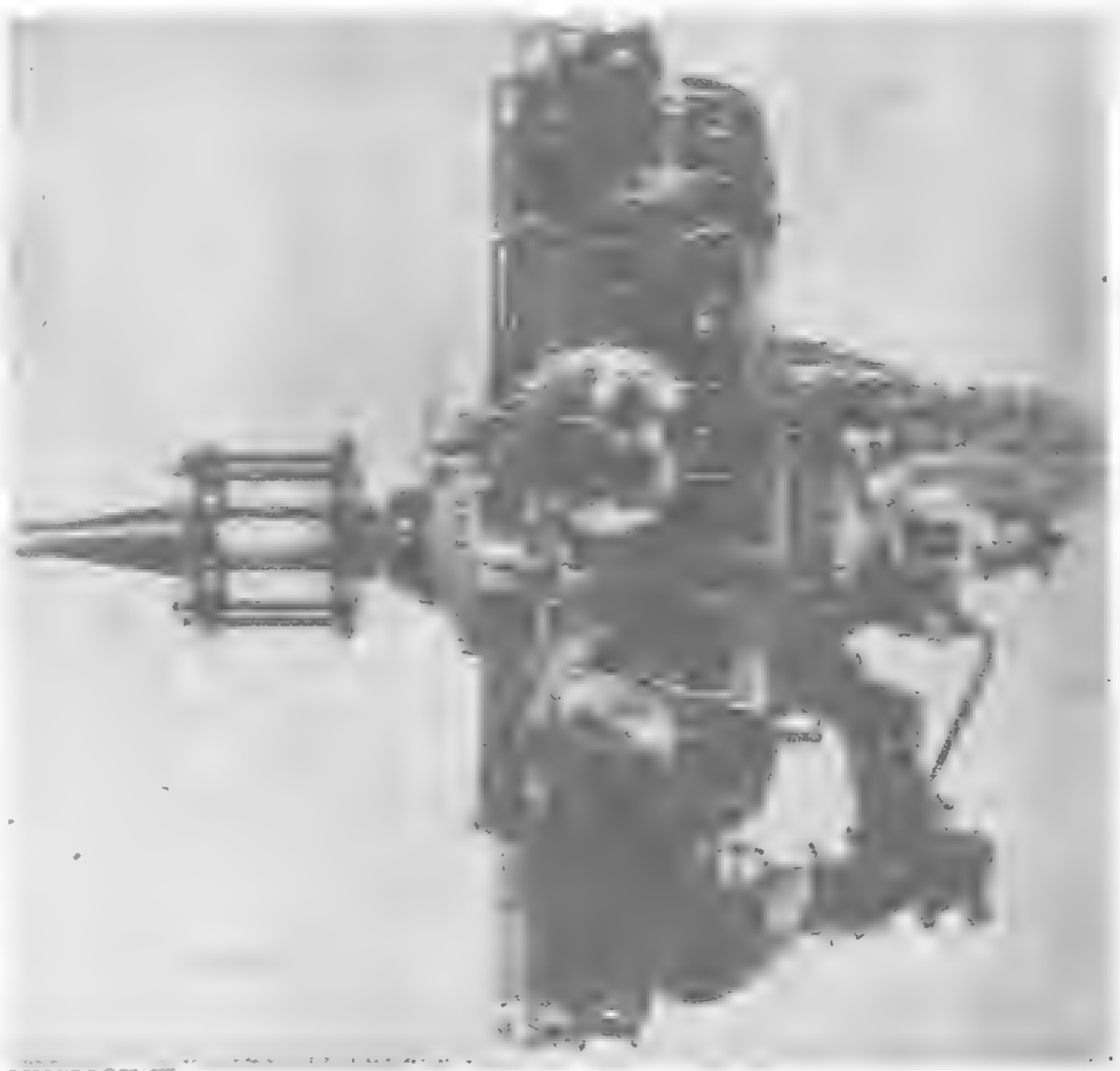
Side by side with the remarkable achievements of the Navy and the Army, civilian flyers distinguished themselves by flying steadily and reassuringly in the commercial lines. Meanwhile the airplane manufacturing industry showed praiseworthy progress, turning out planes and motors of the highest order. But a little more space needs to be devoted to accounts of developments in the early part of the Showa era.

Colonel Lindbergh's trans-Atlantic flight stimulated aviators all over the world. The Société Imperiale d'Aeronautique du Japan subsequently published its plan for a non-stop trans-Pacific flight in 1927, and preparations were begun in earnest. Meanwhile the Navy and the Army continued to be active, completing several record-making flights. Among other flights, a 14-type naval seaplane, equipped with one Lorraine-Dietrich 400-h.p. motor, made a 1,970 nautical mile trip to Chishima, while Captain Kato of the Army established a record of flying 30 consecutive hours, changing his plane once. Besides, night flights, cold endurance flights, and various other kinds of flights were made very frequently. During this year, however, the N-3 airship exploded, resulting in many casualties.

In civilian circles an air meet was held in Tokyo, while in Osaka commercial flying was further improved. The Kaibo Gikai (the Sea Defence Society) had the Kawanishi works build two 8-type monoplanes, which were flown by Pilots Suwa and Kaieda in their 4,600-kilometers round-the-Empire hop, which took place between April 10 and the end of May, the total flying hours amounting to 45. The Tozai Teiki Koku-kai purchased three Kawasaki-Dornier Mercure planes, while the Kawanishi imported a Dornier-Wal, with which Flyer Goto, assisted by a few co-pilots and navigators, flew to Shanghai. Flyers Inui and Hiramatsu in the meantime hopped to Dairen, piloting Kawanishi 10-type passenger planes. Apart from these activities of the air companies, the "Osaka Mainichi" and the "Osaka Asahi" frequently availed themselves of airplanes in the transportation of photographs and in covering news. The Aviation Law, consisting of 140 articles, was promulgated on June 1.

The proposed trans-Pacific flight attracted the most attention of the public during the first nine months in 1928, but was later postponed indefinitely. When the Kawanishi Works built two airplanes to be used for the great flight a difference of opinion as to the efficiency of the craft arose among the Aviation Board authorities, the promoters, and the manufacturer. The issue developed into a further entanglement after the test flights were held at the Kagamigahara aviation field, and it was finally decided that the "Sakura" plane, which was to be used for the hop, was not sufficiently airworthy. The long-pending plan of flying 8,000 kilometers across the ocean thus ended in failure, but the proposal nevertheless contributed much to the forward strides of the Empire's aviation.

Commercial aviation made more progress, and the Tozai Teiki Koku-kai at last opened a passenger service, operating three Kawasaki-Dornier-Mercures, one Mitsubishi M-C 1-type plane, and the Aichi 1-type plane, between Tokyo and Osaka and between Tokyo and Sendai three times a week. The fare charged was Y.35 per head between Tokyo and Osaka, and Y.30 between Tokyo and Sendai. The Nihon Koku Kaisha opened a passenger service between Osaka and Fukuoka with its Dornier-Wal plane, followed by the opening of Mr. Inoue's Sakai aviation field on its line between Osaka and Oita, viâ Shikoku Island. Meanwhile, the Japan Air Transport Company was inaugurated.



The "Nakajima" Jupiter VII. Engine

LEADING PARTICULARS.

Type	9 Cylinder Aircooled Radial, with Gear driven Supercharger.
Bore	5.75" 146 m/m.
Stroke	7.5" 190 m/m.
Total swept volume	1,753 cu. ins. 28.7 litres.
Compression ratio	5.3.
Normal engine R.P.M.	1,775
Maximum engine R.P.M.	1,950
Engine rotates	Clockwise, looking on front.
Propeller	Direct drive left-hand tractor.
Rating at normal R.P.M.	420 B.H.P. at 12,000 feet.
Rating at maximum R.P.H.	440 B.H.P. at 15,000 feet.
Rated boost	Minus 1¼ lbs./sq. inch.
Carburettor	1 Bristol Triplex, oil heated.
Ignition	Dual 2 B.T.H. magnetos.
Ignition control	Variable.
Oil system	Pressure 60 lbs. sq. inch.
Tachometer drive	½ Engine R.P.M.
Fuel recommended	Standard service 80/20 benzole mixture.
Oil recommended	Castrol R, or pure treated pharmaceutical castor.
Standard weight bare	760 lbs.

Following the establishment of the Japan Air Transport Company, the established route between Tokyo and Osaka of the Tozai Teiki Kokukai and the Osaka-Fukuoka line of the Kawanishi had to be conceded to the new company, while the Osaka-Matsuyama line of Mr. Inoue was maintained as a branch line of the new company's business. The Tozai Teiki Kokukai then opened a new line between Tokyo and Niigata. (Details of this company and its business, as well as other organizations conducting regular flights, are to be dealt with separately in another article.) But one noteworthy fact in connection with the establishment of the Japan Air Transport Company is that the activities of all other civilian fields has since been eclipsed; even the Ito aviation field had to change its sphere of activities by opening a light plane club.

Mention might also be made that the "Osaka Mainichi" purchased a Ryan N-P monoplane this year, and Flyer Fumio Habuto of the company accomplished a non-stop Central Japan circuit flight of 2,100 meters from Kagamigahara to Osaka, viâ Sendai, Takamatsu and Okayama, during 13 hours and 23 minutes from sunrise until sunset, this being one of the greatest records established so far. The plane was equipped with a Wright 220-h.p. motor.

Both the Army and the Navy continued to be active. In July the first city defence manœuvres were held by the Army in and around Osaka, and various tests were carried out, including light control. In September 98 Army airplanes participated in air manœuvres held at Kagamigahara, while more than 100 Army planes took part in the review following the Enthronement Ceremony. One striking feature of the latter event was that Colonel Tokugawa, the first man to demonstrate real flying in Nippon, led these airplanes. Other events of importance were that the Army replaced all its aircraft with Japan-made machines, and that an 88-type plane equipped with a B.M.W. 450-motor accomplished a Heito (Taiwan)-Tachiarai non-stop flight during 15 hours and 15 minutes in October. Two 15-type flying boats of the Navy, equipped with one Lorraine-Dietrich 400-h.p. motor each, accomplished a round trip to Saipan Island from Yokosuka, a distance of 9,600 kilometers across the sea.

"Nakajima"-Fokker Super-Universal Six Passenger Monoplane. Top: Front View. Bottom: Side View

During 1929 and 1930 more long-distance flights and impressive air displays were held, showing further progress of aviation.

The Imperial Japanese Air Corps during 1930 flew a distance of about 10,000,000 kilometers in about 180,000 flights, covering about 60,000 hours, carrying 260,000 pilots and co-opilots.

There were 11 deaths and about 30 other casualties in the Army's flying during 1930, due entirely to intense training. Included in the military training are aerial combat, machine-gun practice, bombing, reconnaisance, spotting long-distance flights, night cruise, and aerial target practice.

Even then, there are few events which cannot be omitted. To begin with, there is the opening in September 1929 of the Dairen service of the Japan Air Transport Company. The Kawasaki

"Nakajima"-Breguet-19 Observation Plane

"Nakajima"-Nieuport-29 Fighting Plane

Works completed the Dornier-Wal in October 1929, to be used on the Shanghai run of the J.A.T., making a successful trial flight to Shanghai in the early part of 1930. The Japan Air Transport Company is ready to open the Shanghai run, but the Chinese Government is not inclined to have it started from a peculiar standpoint of national defence and air sovereignty. Nanking has asked the company to put off the operation of this line until such time as China signs the International Air Navigation Treaty.

In March 1930 the Kawanishi Works commenced the construction of a new factory at Naruo, half-way between Osaka and Kobe, which was completed about the middle of December, 1930. Attached to this factory is an aviation field, where the Kawanishi planes are tried out.

The big international events registered in Japan's history of aeronautics in 1930 were that Zensaku Azuma, of Los Angeles, flew across the United States, went to Europe by a steamer, and then flew to Tokyo, via Siberia, arriving at the Capital in August. Almost simultaneously with Mr. Azuma's homecoming, Seiji Yoshiwara made a successful air jaunt between Berlin and Tokyo, covering a distance of 11,000 kilometres within 11 days.

One remarkable tendency during 1930 was that students showed a sudden enthusiasm toward aviation. Six universities and two colleges of Tokyo organized the Japan Students' Air Navigation League in April 1930. The members started learning to fly in June under the guidance and support of the Aviation Board and various other organizations. They expect to hold their first air contest in the Spring of 1931. Included among the seven airplanes in use are one Ishikawajima-Moth type with wing-slots, three Avro planes, and one "Ko" type Army plane. Soon after the Tokyo students organized their air society, students of Kyoto and Osaka followed their exmaple.

The year 1931 promises to be one of the most active years since aviation was introduced in Japan. A 2,000-h.p. tri-motored naval flying boat, built at the HiroNaval Works in January, made a successful trial flight on January 27 in the presence of 300 people interested, while the Kawanishi Works is now engaged in the assembling of a similar large naval flying boat that recently arrived from Short Brothers, England.

Much has been said about the dimensions and power of the Short Brothers' boat, but the "Osaka Mainichi" recently reported that it is a six-seater all-metal biplane along the line of the Short "Singapore" type, equipped with three 830-h.p. Rolls-Royce motors. The span is 30 meters (upper wing), length 20 meters, weight (empty), 12.5 tons. It is said that the plane is capable of flying 200 kilometers an hour, maximum speed, and that it can cruise for ten consecutive hours. This plane is the largest that the Imperial Navy owns so far, but it is going to be the medium-sized type according to the naval plan.

A duration record of flying for 30 hours and 50 minutes was established by a Japan-made semi-rigid airship of the Kasumigaura naval air corps on February 12 and 13, while Baron Narahara, pioneer airman of Japan, was reported to be absorbed in the manufacture of a small monoplane helicopter. It is learned that the plane, equipped with a small gyro balancer, will be completed in about September 1931.

Aerial photography in Japan is growing in popularity and with such steadiness that aerial photograph companies will be brought into existence.

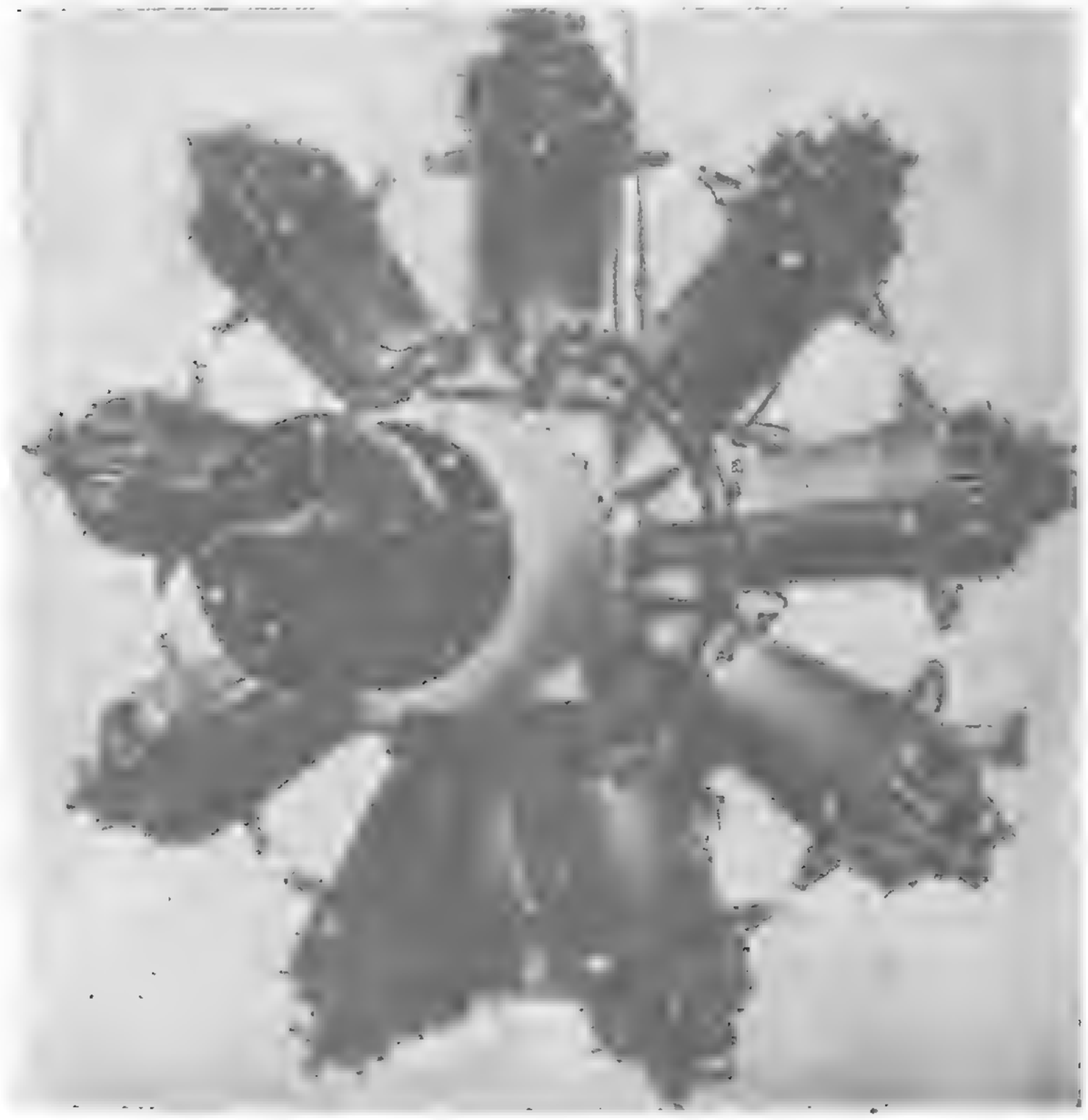
Apart from military purposes, the aerial photographing business is now utilized for various civil administrative purposes, the latest instances being the photographing of Tokorosawa and districts by the Railway Department for the purpose of railway construction, and the production of the aerial map of Chiba City by the Chiba Municipal Office for the purpose of completing a proper postal delivery service system for the city.

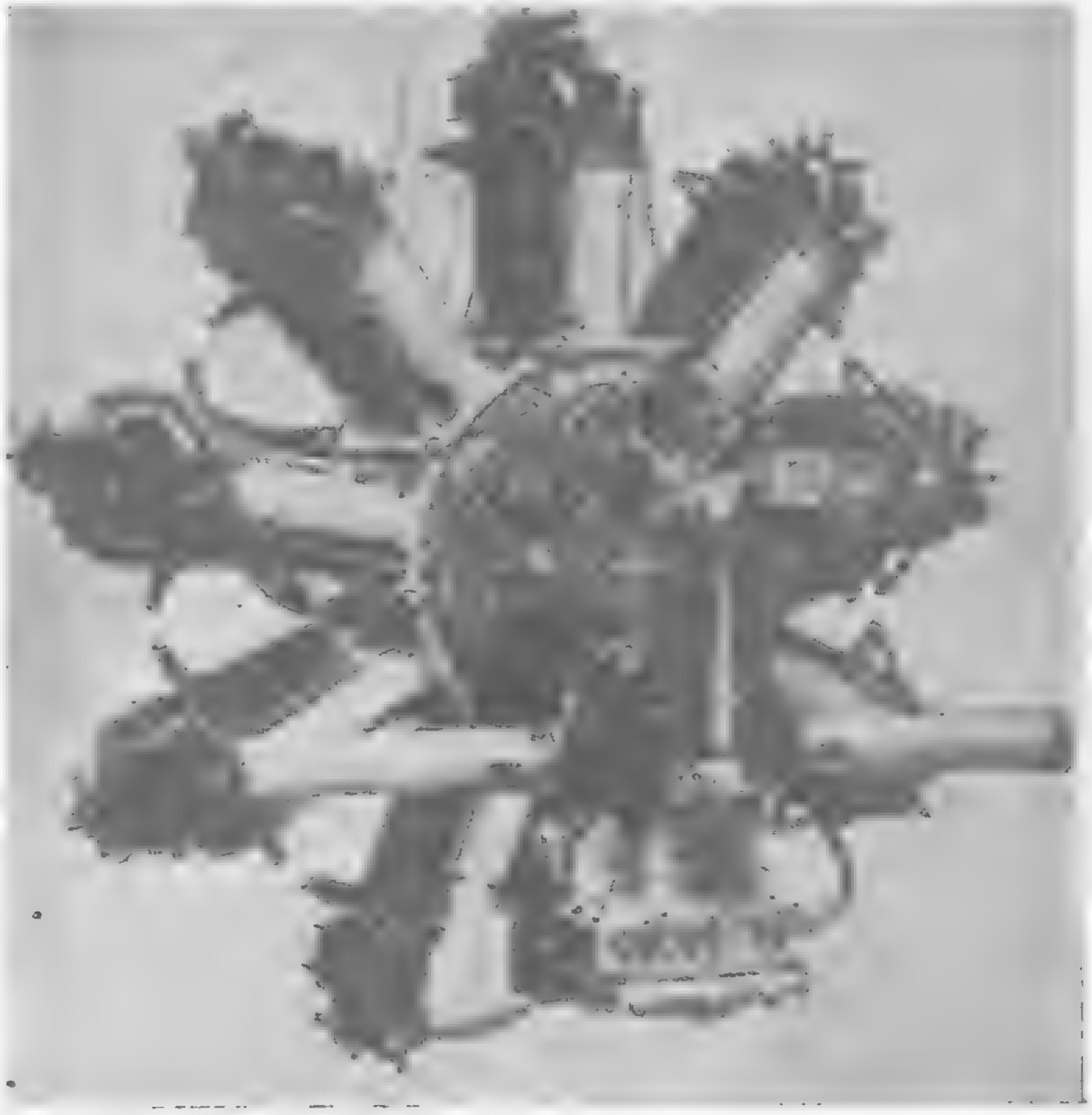
Many an electric and other industrial enterprising company of Tokyo and districts also propose making use of this aerial photographing service for land survey and other engineering purposes, while some enterprising citizens are already planning the establishment of a business company to undertake an aerial photographing service for various public purposes.

Commercial Aviation in Japan

One million miles of commercial flying with no accident—this is the proud record for 1930 of the Japan Air Transport Company, which represents the civil aviation of the Empire.

This Company operates a 2,000 kilometer service connecting Tokyo, the Capital, with Dairen, the port of Manchuria, traversing the Straits of Tsushima and the Peninsula of Korea. It is now





The "Nakajima" Jupiter Series VIII. Engine

LEADING PARTICULARS.

Type	9-cylinder air-cooled radial.	Ignition control	Variable.
Bore	5.75" 146 m/m.	Oil system	Pressure 60 lbs. sq. inch.
Stroke	7.5" 190 m/m.	Tachometer drive	½ Engine R.P.M.
Total stroke volume	1,753 cu. ins. 28.7 litres.	Fuel recommended	Standard service 80/20 benzole mixture.
Normal engine speed	2,000 R.P.M.	Oil recommended	Castrol R. or pure treated pharmaceutical castor.
Maximum engine speed	2,200 R.P.M.		
Propeller	Left-hand tractor.	Standard weight, bare	880 lbs.
Propeller gear ratio	2 : 1.	Compression ratio	5.8
Carburettor	1 Bristol triplex.	Rated B.H.P. at normal R.P.M.	440 at 4,000 ft.
Ignition	Dual 2 B.T.H. magnetos.	B.H.P. at maximum R.P.M.	480 at 4,000 ft.

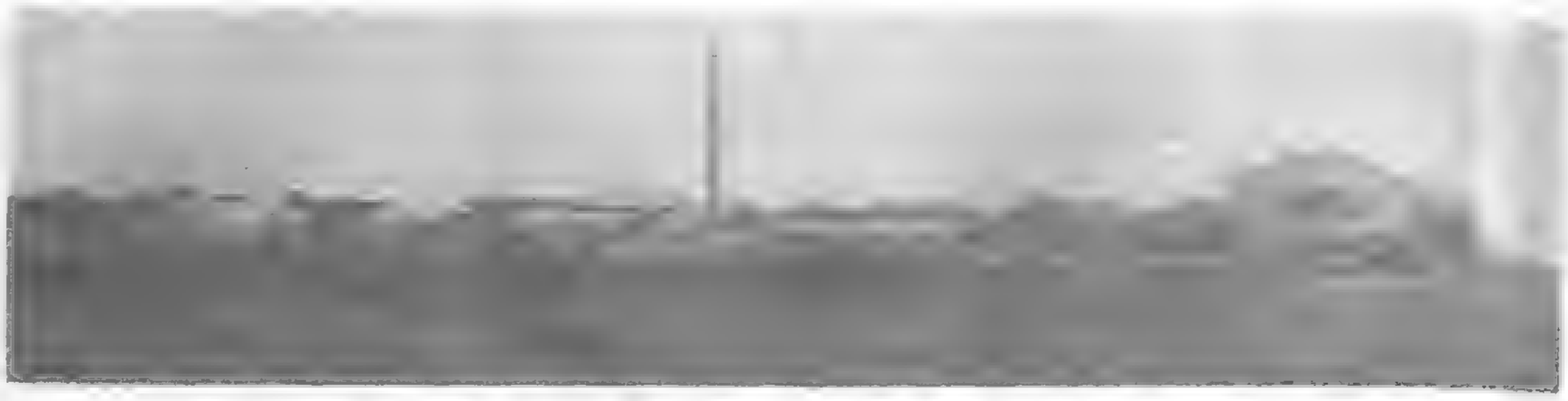
ready to open the Osaka-Shanghai line, a distance of 1,450 kilometers, while test flights are being made preparatory to inaugurating an air mail and passenger service between Japan and Formosa.

The Asahi Aviation Society operates a service of 480 kilometers between Tokyo and Niigata. The Japan Aviation School runs a 150-kilometer line between Tokyo and Shimoda, on the Izu peninsula, while the Chosen Aviation Research Society and several other organizations conduct occasional flights for transport of mail and passengers. The use of planes to locate schools of fish for the trawling fleets operating in the seas adjacent to Japan has been a great help in providing the people with food.

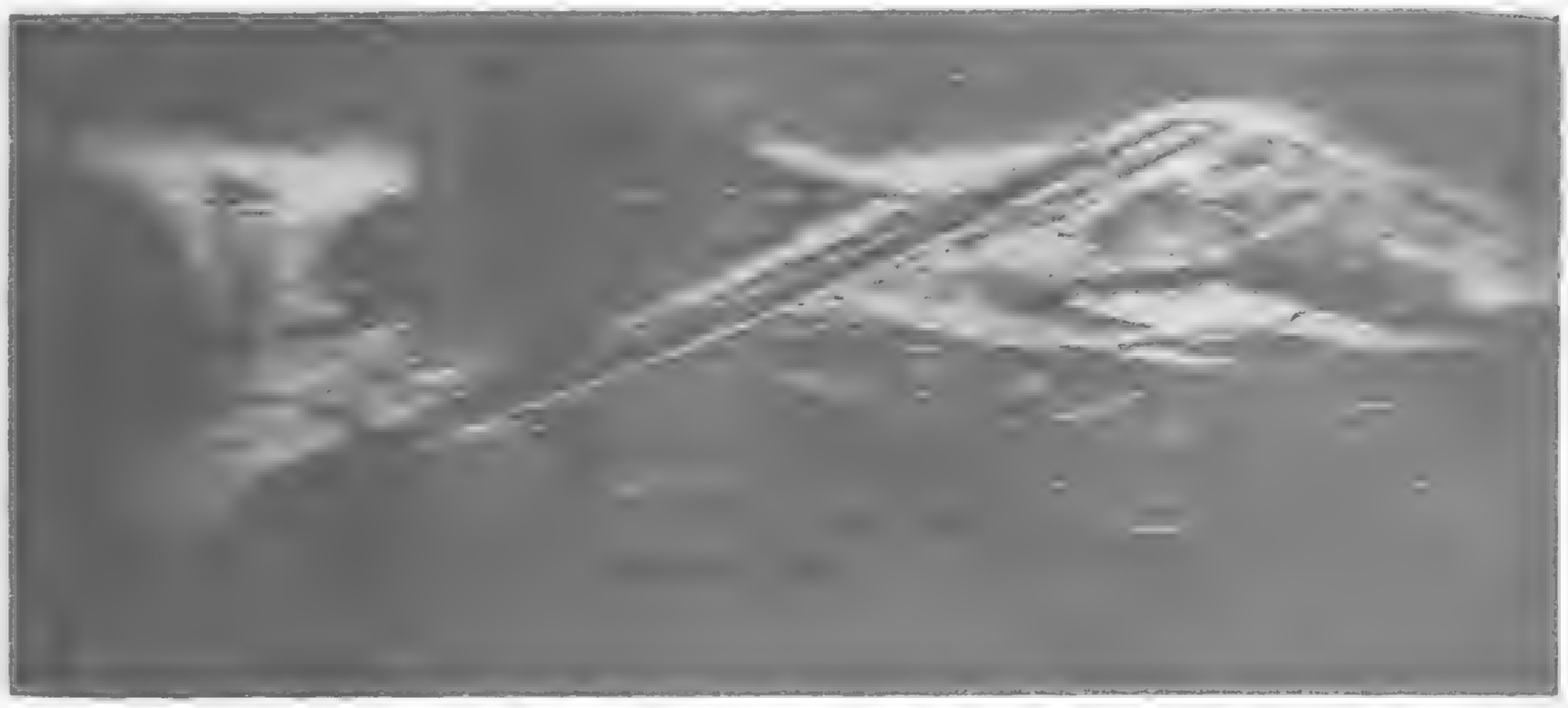
With all her achievements Japan is still in the early stages of development as compared with the phenomenal progress in Europe and America. But Japan has long passed the experimental stage; aeroplanes have become a practical means of transportation. Large newspaper companies and press agencies own and operate planes for their distribution and news collecting purposes, taking the lead in making the nation more air-minded. To-day the air passenger services are being availed of not only by business men, but by students and women.

Especially noteworthy is the fact that the rising generation shows great interest in aviation. When toward the end of 1929 the Imperial Navy offered to 100 boys the opportunity to train for naval flyers, more than 7,000 from all parts of the country filed applications. These boys are now being trained at the Yokosuka Naval Air Base. University students have organized aviation societies in a number of large cities, while the Hosei University boys of Tokyo, among others, have announced their intention of making an air trip to Europe during the spring or early summer of 1931. Even the girls in Japan are enthusiastic. When the Japan Air Transport company advertised recently for three girls to serve as conductresses and waitresses on their passenger planes plying between the principal cities of Japan, more than 130 applications were received. Most of the applicants were from well-to-do families and graduates or students of high schools. The three successful candidates will be employed on the Tokyo-Shimoda-Numadzu-Shimidzu passenger air-line to explain the sights and serve tea or coffee to the passengers.

The Japanese movie producers are working closely with the authorities in popularizing the air forces of the Empire. In addition to the news reel and stunt pictures, a new war film entitled "The



Aerial View of The Naruo Works of the Kawanishi Flying Machine Company



General View of the Kawanishi Flying Machine Company's Plant

Metallic Propeller made by the Kawanishi Company

Wind Shaft in Kawanishi Works

Test Tank in Kawanishi Laboratory

Great Air Force" has been produced by the Tokyo Cinema Shokai in co-operation with the War and Navy Aviation Departments and the *Osaka Mainichi*. The plot follows the usual friendship between a Japanese ace and a crack flyer of the "certain country" enemy, the inevitable war and a great Japanese victory in the air, followed by grand naval and military reviews of the whole war forces of the Empire. Good propaganda stuff, calculated to arouse patriotic interest in the new air force.

So far, Japan can boast of no outstanding contribution to the progress of aviation such as long-distance or non-stop flights, speed

Kawanishi Aeroplanes

No. 2 Type, land monoplane, one seat; Hall-Scott motor, 200 h.p.; 9.67 m. in full width; 6.57 m. in full length; 2.35 m. in height; weight, 680 kilograms; loading capacity, 180 kilograms; highest speed, 234 kilometers; rising capacity, 7.600 meters. The plane of this type was constructed in August, 1921. This is modelled after the Junker Type.

Kawanishi No. 2 Type Plane

No. 3 Type, land biplane, three seats; Maybach motor, 260 h.p.; 10.03 m. in full width; 8.86 m. in full length; 1.6 m. in height; weight, 970 kilograms; loading capacity, 430 kilograms; highest speed, 224 kilometers; rising capacity, 8,500 meters. This was constructed in October 1921, and performed with success its passenger transportation flight between Kagamugahara and Tokyo in February 1922. This was the first enterprise in Japan. This plane has such superior faculty and speed that it has shown satisfactory results at all aviation contests held in Japan.

Kawanishi No. 3 Type Plane

No. 6 Type, bi-seaplane, three seats; Maybach motor, 260 h.p.; 13.6 m. in full width; 10.375 m. in full length; 3.785 m. in height; weight, 1,150 kilograms; loading capacity, 750 kilograms; highest speed, 155 kilometers; rising capacity, 6,500 meters. The construction of this seaplane was completed in November 1923, and was christened as "Shumpugo" by His Imperial Highness Prince Yamashina. In the summer of the following year it performed a flight round Japan proper, the first attempt in Japan, accomplishing it in eight days, for which it has won fame in aviation circles in Japan. The enterprise was undertaken under the joint auspices of the *Osaka Mainichi* and the Kawanishi Company. By the way, this plane has a record of having risen to an altitude of 5,000 meters with five persons on board.

Kawanishi No. 3 Type

No. 7A Type, bi-seaplane, six seats; Maybach motor, 400 h.p.; 12 m. in full width; 11 m. in full length; 4.08 m. in height; weight, 1,250 kilograms; loading capacity, 750 kilograms; highest speed, 195 kilometers; rising capacity, 6,000 meters. This plane was constructed in November 1924 for the Japan Aviation Company to be employed for the transportation service between Osaka and Fukuoka. It achieved good results in its trial transportation flight between Osaka and Shanghai in October 1926, and also won the first prize in the contest round Lake Biwa held in November 1925, under the auspices of the Imperial Aviation Company.

Kawanishi No. 6 Type, the "Shumpo Go," which made a round-Japan flight

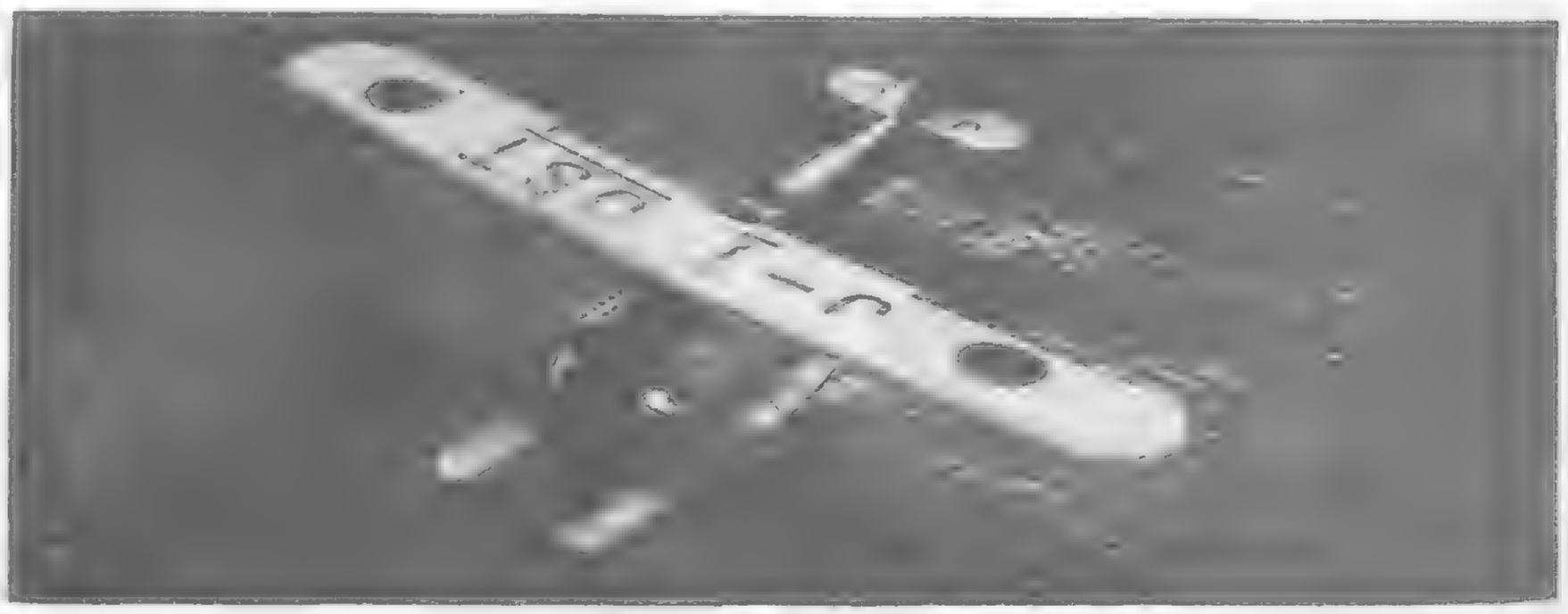
or altitude records, but the nation is making steady and rapid progress. A Japanese record of attaining a 10,000 meter altitude was established at the Kagamigahara ground by a civilian flyer during the latter half of 1930, while in the field of aeroplane construction two crack all-metal battle-planes, equipped with one 750 B.M.W. motor each, developing a speed of 330 kilometers an hour, were built by the Kawasaki Works of Kobe during the latter half of 1930. In the meantime the T.G.E. (Tokyo Gas Electric Engineering Company) produced the first aero-motor (130 h.p.), entirely Japanese in design, material and workmanship. It is reported that the Kawasaki Dockyard is preparing to build the world's largest seaplane, and although the usual secrecy is being observed, it is understood that, like the Do-X, the new ship will be mounted with twelve motors of at least 600-h.p. each. The designers plan to build a larger and more powerful boat than the Do-X, one that will maintain an average speed of 125 miles an hour with a capacity load of 160 passengers. The Kawasaki Company holds many of the Dornier patents and has engaged the services of Dr. Voight, a pupil and assistant of Dr. Claude Dornier, builder of the Do-X, and its works are technically capable of turning out such a boat. An official of the company admits that they are engaged on the plans and hope to turn out something bigger and more powerful than the gigantic Do-X., but they are wondering where they will find a purchaser for the boat.

No. 7B Type, biplane, two seats; Lorraine motor, 400 h.p.; 12 m. in full width; 11 m. in full length: 3.8 m. in height; weight, 1,284 kilograms as seaplane, and 1,150 as land-plane: loading capacity, 800 kilograms as seaplane and 1,180 as land-plane: highest speed, 212 kilometers as seaplane and 220 kilometers as land-plane: rising capacity, 7,000 meters. This plane, which was constructed in November 1925, to be used for the transportation service between Osaka and Dairen, has such advantages that it can be changed into both seaplane and land-plane by means of changing its legs. Besides, it is equipped with what is called a flap, which enables it to increase or decrease its floating power. In recognition of those advantages, the Ministry of Communications has granted the Kawanishi Company a subsidy of Yen 30,800 in order to encourage the manufacture of aeroplanes in Japan.

Kawanishi No. 7 Type

Three No. 7 Kawanishi Seaplanes arriving at Moppo, Korea, on their flight to Shanghai

No. 8A Type, mono-seaplane, two seats; Maybach motor, 260 h.p.; 17.6 m. in full width; 10.935 m. in full length; 3.68 m. in height; weight, 1.320 kilograms; loading capacity, 610 kilograms; highest speed, 165 kilometers; rising capacity, 6,500 meters. This plane is equipped with thick mono-wings and is the first of its kind ever designed in Japan. It has shown good results in its mail service between Osaka and Fukuoka.



Kawanishi No. 8 Type

No. 8B Type, mono-seaplane, two seats; Maybach motor, 260 h.p.; 16 m. in full width; 11.8 m. in full length; 4.04 m. in height; weight, 1,346 kilograms; loading capacity, 610 kilograms; highest speed, 175 kilometers; rising capacity, 6,500 meters. Two planes of this type were constructed by order of the Volunteer Coast Defence Society. When employed in a flight round Japan Proper, held under the auspices of the Society, they completed their mission successfully. Later they were chartered by the Japan Aviation Company to be used for the mail transportation service.

Kawanishi No. 8 Type

Kawanishi No. 10 Type

No. 10 Type, bi-land plane, five seats; Maybach motor, 260 h.p.: 13 m. in full width; 8.9 m. in full length: 3.55 m. in height: weight, 1,057 kilograms; loading capacity, 705 kilograms; highest speed, 173 kilometers; rising capacity, 6,000 meters. The construction of this plane was completed in August 1926, to be used for the passenger and mail service between Osaka and Dairen.

Two additional outstanding events in Japan's aeronautical progress were reported during the first half of January 1931: one, the construction of a Y.400,000 naval flying boat at the Hiro Works of the Naval Arsenal in Hiroshima, and the other the perfection of a 1,000-h.p. air-cooled aero-motor at the Nagoya Works of the Mitsubishi Aircraft Company, Ltd.

Spurred to action by the remarkable developments in aviation in Europe and America, the Air authorities of the Imperial Navy decided to build a flying-boat worthy of the prestige of the Empire, and in January 1930 ordered the Hiro Naval Works to build a new type of machine. The plane was completed, and, after its trial flights at Hiro, assigned to the Yokosuka naval air corps. This boat, designed and constructed by the experts of the Imperial Navy, weighs 11½ tons; the number of motors is a secret, but are said to have an aggregate capacity of 2,000 h.p. The craft will accommodate seven men, and has a flying radius of 2,000 nautical miles at 100 m.p.h. Six 7.7 m.m. machine-guns and a number of 500 kilogram bombs will form her fighting equipment. Various wireless apparatus is also installed. The cost of construction is reported to be Y.400,000. At the time work was started on this flying-boat the Navy placed an order with Short Brothers Co., of Rochester, England, through the Kawanishi Airplane Works of Kobe, for a similar machine. The English-built ship arrived last month at Kobe and is being assembled at the Kawanishi Works. Although no exact data in regard to the size and power of this plane has been made public, it is said to be slightly smaller than the Do-X, and is by far the greatest flying-boat built for naval purposes, containing several distinct features not equalled anywhere. A similar plane will be built at the Kawanishi Works for the Japanese Navy.

The 1,000 h.p. radiator type air-cooled aircraft motor of the Mitsubishi aircraft works is claimed to be the largest of its kind ever built in the world. The Kaibo Gikai, or Coast Defence

Kawanishi No. 12 Type

No. 12 Type was constructed to be used for the projected flight across the Pacific.

The Ishikawajima Light Plane, with Slotted Wing, manufactured by the Ishikawajima Aircraft Co., Ltd.

Volunteer Society, originated the idea of building this powerful motor. The machine represents nine years' painstaking research work by a committee of ten experts, representing the Army, the Navy, and the Aviation Research Institute.

The experts began by designing a 180 h.p. water-cooled motor which was ordered from the Mitsubishi Works, but in view of the rapid development of large horsepower motors abroad, a 450 h.p.—then a 600 h.p.—motor was designed, but even these were obsolete before they emerged from the blue print stage. The committee, headed by Dr. Susumi and Dr. Narahara, then decided to double the power of the third motor, introducing the air-cooling system. The motor was built and underwent successfully a 50-hour endurance test toward the close of 1930. It will be presented to the Imperial Navy by the Kaibo Gikai.

Commenting on its performance, Rear-Admiral Ando said that it was premature to praise it; but, from what he had seen and heard, the machine appeared to be superior to the best types of foreign air-cooled motors.

Tachikawa Plant of the Ishikawajima Aircraft Company, Ltd.

Another report, emanating from Tokyo, says that a young man in the employ of the assembling department of the Ito Aircraft Manufacturing Works of Tsudanuma-machi, Chiba Prefecture, has perfected an original aircraft motor with more than twice as much power as ordinary motors, for which he has obtained a patent, "Internation Combustion Engine No. 13,901," from the Japanese Government, and has sent his motor to the laboratory of Dr. Suhara, of the Aviation Research Laboratory of the Imperial University of Tokyo, for examination and tests. The remarkable thing about this invention is that the man, Masando Ueno, aged 25, without means, availing himself of leisure moments and making use of waste material at the Ito Works, built and assembled the motor which has created such intense interest. Mr. Otojiro Ito, proprietor of the Ito Works, is reported to have opened negotiations with an influential motor manufacturing company to undertake its production.

Apart from such efforts to produce original motors and flying craft, all the leading aeroplane and motor makers of Japan have secured the patent right to manufacture foreign airplanes and motors of various types. In addition, such parts and accessories as motor starters, radiators, slot-wings (notably the Handley Page), propellers, etc. of foreign device, are also being produced at Japanese works.

Japanese aircraft manufacturers, with their great plants and facilities, will not be content to confine their activities to the limited home market and will seek outlets for their products in other parts of the Orient. The Imperial Civil Aviation Association, which promoted the unsuccessful transpacific flight, has announced its intention of turning its activities to China. It plans to send an investigation committee to study the possibilities of commercial transport services in China in order to develop Sino-Japanese co-operation in this direction. The officials of the association are satisfied that the old international rivalry between the Powers for railway concessions and building contracts in China is passed, and that for many years to come it will be more economical to develop air transportation in this country. The immense trade between Japan and China gives rise to the hope that a project of aerial transport services in China will benefit both countries.

Admitting that what has been accomplished to date by Japan in aviation cannot be described as brilliant, one may safely state that she is making distinct progress and that a bright future is in store for Japan's aeronautical enterprises.

Aeroplane Manufacturers in Japan

THE manufacture of aircraft is rapidly becoming one of the major industries of Japan. The technique of building airplanes has kept pace with the progress of aerial navigation, the civilian manufacturers acquiring knowledge and experience through co-ordinating their activities with the naval and military arsenals at Hiroshima and Nagoya. Most of the airplanes in daily use in Japan are now manufactured in the country.

The Aichi AB-I Four-Seat Commercial Seaplane: 450-h.p. Aichi-Lorraine-Dietrich Engine

Due to the fact that the Navy and the Army have classified aeroplanes as important weapons of war, their manufacture has had a rapid development, enabling the Japanese makers to crowd out the foreign-made machines. Japanese experts, however, admit that it is less expensive to import foreign aeroplanes than to build them at home, but every effort is being made to encourage the use of home-made planes in order to check imports, except for the purpose of studying them. The policy of the War authorities is to make the nation self-contained in this matter; and as a natural sequence to this policy, none of the aeroplane makers in Japan can publish data that conveys any definite idea as to their manufacturing capacity or the cost of construction.

Lieut.-Commander T. Nakahima, of the Imperial Navy, however, gives a general idea concerning the cost of production. As the capacity differs, so the cost varies, but he estimates that a war-plane costs from Y.30,000 to Y.150,000. He says that the body will cost about Y.18 per kilogram (unloaded), that is, Y.12,600 for a 700-kilogram plane; the motor will cost about Y.60 per horse-power, that is, Y.7,800 for a 130-h.p. motor. Consequently, a 700-kilogram plane equipped with a 100-h.p. motor costs about Y.20,000.

At a recent round-table discussion on the present situation of aviation in Japan and abroad, attended by representatives of the Department of Communications, Navy, Army, The Japan Air Transport Company, and several others, it was pointed out that the cost of manufacturing motors in Japan was about 50 per cent higher than in foreign countries, but that the cost of building the body was somewhat lower.

The Japanese motor producers, explaining their side of the case, contend that even with first-class designers, technicians, equipment, and skilled operatives, the high cost of imported materials is the determining factor in the final production cost. Aluminium, for instance, is imported from the United States, France, Germany and Switzerland. Magnet steel must be imported; Dr. Honda's product, while excellent, is too hard for aeroplanes. Insulators and spring steel must be imported, notwithstanding that Japan-made spring steel is of such excellent quality that it can at a pinch be used in place of the imported article. In the matter of machine tools, domestic machine tools are now very widely used, but the engineers prefer foreign-makes for the precision work required in aeroplane motor manufacture. Despite these disadvantages, the technique of building motors is so advanced that the domestic product is considered just as good as any manufactured abroad. The Japan Air Transport Company, among other firms, has equipped their planes with both domestic and foreign motors, and find nothing to choose between them.

Generally speaking, what Japan needs is good designers. Where the technique of handling aeroplanes is concerned there are many pilots who can be compared favorably with any of the best foreign flyers. They have mastered the art of flying. The attention of those interested in aviation is focussed upon producing excellent airplanes at home factories.

The Aichi AB-II Four-Seat Commercial Biplane: 450-h.p. Aichi-Lorraine-Dietrich Engine

A summary of the activities of eight representative airplane and motor makers in Japan gives some idea of what is being accomplished :—

Mitsubishi Kokuki Kabushiki Kaisha (Mitsubishi Aircraft Co., Ltd.)

Cable Address: "Iwasakiair Tokyo."
Head Office: Marunouchi, Tokyo.
Works: Nagoya and Tokyo.
Aerodrome: Nagoya.
Manufactures: Aircraft, aero-engines, aeronautical arms, automobiles, etc.
Capital: Y.5,000,000 (paid up).
Chairman: Vice-Admiral K. Funakoshi, I.J.N. (retired).
Managing Director: Y. Shibuya.

This company was evolved from the Kobe Internal Combustion Engine Works of Mitsubishi Shipbuilding & Engineering Company, Limited, where heavy oil engines formed the main manufacture. Owing, however, to the ever-increasing demand for such engines, and in order to embark on the production of aircraft and aero-engines, etc., the Works were detached to form the nucleus of a new company, registered in 1920 as Mitsubishi Nainenki Seizo Kaisha, Ltd. (Mitsubishi Internal Combustion Engine Manufacturing Co., Ltd.), and with the inauguration of this new concern extensive works were laid down at Nagoya for the exclusive manufacture of aircraft.

Factory of the Itoh Aircraft Works

In 1921 the name of the company was altered to Mitsubishi Nainenki Kaisha, Ltd. (Mitsubishi Internal Combustion Engine Co., Ltd.), and in the following year another works was established at Shibaura (Tokyo) as a branch of the Nagoya plant.

Because of the immense development of its aircraft business the company decided to devote its whole activities to aircraft production, and in pursuance of this policy the Kobe works, manufacturing heavy oil engines for other than aeronautical purposes, was transferred back to the sister concern, Mitsubishi Shipbuilding & Engineering Co., Ltd., on May 1, 1928, and the name of the company at the same time was accordingly amended to its present form: Mitsubishi Kokuki Kabushiki Kaisha (Mitsubishi Aircraft Co., Ltd.), to be in keeping with the activities undertaken.

At this time it was found necessary to enlarge the Nagoya works and Shibaura branch plant, which was undertaken forthwith. The head office also came within the scope of this expansion in order to cope fully with the situation arising out of this revision of policy.

The Tokyo works is a recent addition to the manufacturing facilities of the company, as it was established on December 1, 1929, specially for the production of arms (for aeronautical purposes) and machinery.

At the present time the Nagoya works cover an area of 59 acres (72,000 tsubo), and more than 2,400 executives and workmen are constantly employed there. It is the largest of its kind in Japan, and its equipment comprises the latest and most up-to-date machinery and apparatus for the production of aircraft and aero-engines.

A Japanese "Dornier" Seaplane, built by the Kawasaki Dockyard, Kobe, for the Navy

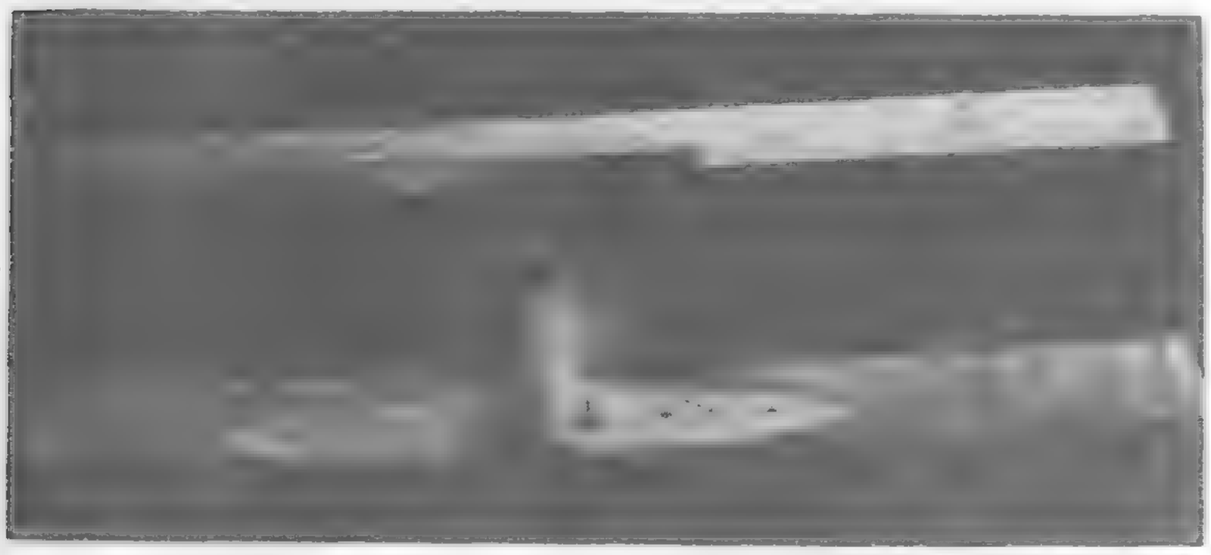
The company has since its inauguration supplied to the Imperial Japanese Navy and Army a great number of fighters and bombers, deck fighters, deck reconnaissance machines, deck bombers and training machines, as well as aero-engines. In view of the nature of these machines, the specifications, particulars, performance, etc., are not available for publication.

Licences held by the company include Hanriot training machines, Blackburn reconnaissance torpedo carriers, Curtiss fighters, all types of Hispano-Suiza aero-engines, Armstrong Siddeley aero-engines, Reed-Levasseur metal airscrews, Claudel carburettors, Lamblin radiators, Farman reduction gear for aero-engines, Herzmark and Letombe engine-starters, and Handley Page slotted wings.

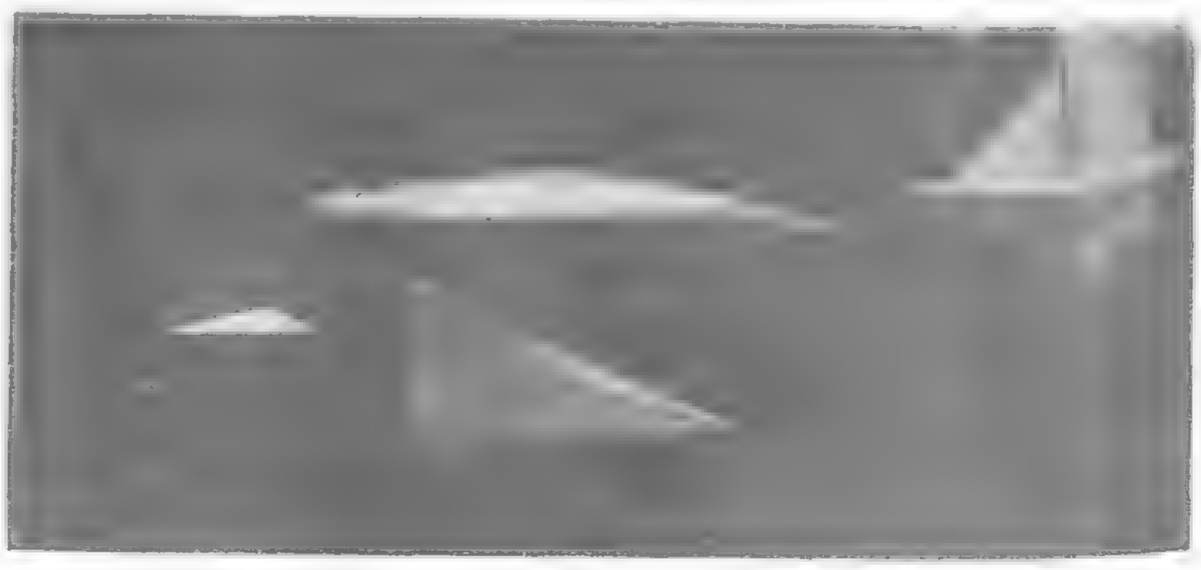
In view of the recent development of civil aviation in Japan the company has obtained a licence to construct Junkers aircraft and aero-engines. Several of the Junkers F-13 type are already in service.

Kabushiki Kaisha Kawasaki Zosenjo Hikoki Koji

(The Airplane Works of the Kawasaki Dockyard Co., Ltd.)
Kobe Head Office : No. 14, 2-chome, Higashi-Kawasaki-machi, Kobe.
Kobe Factory: Otake, Higashi-Shiriike-mura, Kobe.
Kagamigahara Factory : Naka, Kagamigahara, Gifu Prefecture.
Established : August, 1918.
Capital : Part of Y.90,000,000.
Business: Airplane Works: Manufacture of war and commercial airplanes and flying boats, aero-motors, and parts thereof.



Itoh Sports Plane: 40-h.p. Motor: 129 km. Speed



Itoh Glider

In August, 1918, the machinery designing department of the Kawasaki Dockyard Company opened a motor-car section and commenced the manufacture of motor-cars other than for civil and commercial purposes. In January of the following year the undertaking was removed to the Hyogo factory of the company and established as an independent department. In August, 1919, Mr. Kojiro Matsukata, then president of the company, obtained the right to manufacture the body and motors of the French Salmson aeroplane, and preparations to build these machines were started at the Kobe office.

The Salmson plane being adopted as the official craft of the Japanese Army, the company was awarded the contract to deliver a stipulated number of planes annually. Until 1927 the Kawasaki Dockyard therefore concentrated on the manufacture of this type of airplane and motors. In July, 1921, 60 acres of land were purchased at Kagamigahara, Gifu Prefecture, on which an assembling factory was erected and, in August, 1922, aeroplane manufacturing became one of the independent departments of the company.

In the autumn of 1923 the company commenced to design and experiment on the construction of large-type metal planes in accordance with a request of the Aviation Department of the Imperial Army, and its work was carried out with the co-operation of Dr. Dornier of Germany. The first plane on this program was completed in January, 1926 (the first all-metal plane made in Japan), and adopted by the Army for heavy bombing and designated as 8-7 type.

Another machine, whose design and construction was requested by the Army Aviation Board in November, 1925, was completed in December, 1926, and adopted as the 8-8 type scouting plane of the Army. The company has since built many of these machines.

The BMW 450-h.p. motors, whose exclusive manufacture and sale in Japan was acquired by the company in 1924, has been adopted by the army as official motors for the 8-7 type heavy bombing plane and the 8-8 type scouting plane. Since 1927 the company has also built several all-metal commercial passenger planes and flying boats for the *Osaka Asahi* and the Sea Defence Society—the first all-metal machines built in Japan.

Nakajima Hikoku Seisakujo

(The Nakajima Airplane Manufacturing Works).

Head Office : Ota-machi, Nitta-gun, Gumma Prefecture.
President : Kiyoichi Nakajima.
Ota Factory : Ota-machi, Nitta-gun, Gumma Prefecture.
Tokyo Factory : Toyotama-gun, Tokyo Prefecture.
Tokyo Office : Yurakukan Building, Marunouchi, Kojimachi-ku, Tokyo.
Established : December, 1917.
Capital : Y.8,000,000. Of which : the Ota Factory, Y.2,500,000; the Tokyo Factory, Y.5,500,000.
Business.—Designers and manufacturers of airplanes and aeromotors.

This company commenced the designing and manufacturing of airplanes at its present Ota factory in December, 1917, since when it has made a rapid and sound development, keeping pace with the progress of the times. In March, 1924, the company opened its Tokyo factory for manufacturing aeroplane motors.

The products of the company now include :—Four types of battle planes, 3 types of battle planes, and 15 types of scouting seaplanes.

This company is engaged in supplying aircraft and engines to the Japanese Army, Navy, and the Japan Air Transport Co. They hold the manufacturing licence to construct the following aeroplanes and engines :—

AEROPLANE.

Nieuport-Delage—Type 29
Bregnet—Type 19 and 14
Gloster—" Gambet "
Fokker—" Super Universal "
Vought—" Corsair "

ENGINE.

Bristol—" Jupiter "
Lorraine—500/900 hp.
Pratt & Whitney—" Wasp " & " Hornet "
Curtiss Wright—" Whirlwind " J5 and 6.

The recent outstanding achievement of this company (a Mitsui subsidiary), resulting from an agreement concluded between the Mitsui Bussan Kaisha and the New York office of the Fokker Company in the early part of 1930, is the sole right to manufacture the products of the famous Dutch company in the Far East. The Japan-made Fokker planes are to be used by the Japan Air Transport Company, but will also be sold throughout the Far East by the Mitsui agencies. As a result of this arrangement, the company has considerably enlarged its manufacturing capacity.

Aichi Tokei Denki Kabushiki Kaisha

(The Aichi Clock & Electric Machinery Co., Ltd.)

Head Office : Funakata-cho, Chitose, Minami-ku, Nagoya.
Nagoya Factory : Tsukiji, Minami-ku, Nagoya.
Established : March, 1898.
Capital : Y.5,000,000.
President : K. Aoki ; *Director* : B. Masumoto.
Business: Manufacture of clocks, arms and electric machinery.

This company started business in a small way, manufacturing clocks, electric machinery and naval arms. In 1920 its capital was increased to Y.5,000,000 and it commenced the manufacture of aeroplanes. The company has frequently sent employees abroad to study the technique of foreign factories and also to obtain special materials. It has also invited experts from Great Britain, France and Germany as instructors to train its employees.

When the Department of Communications held a prize contest of designs of land and sea air transport in February, 1926, the company won the first place for seaplanes and the second prize for land-planes. It subsequently constructed an amphibian plane, the AB No. 1. type, which proved to be very satisfactory when used by the East and West Regular Aerial Navigation Society and by the Japan Air Transport Company.

In July, 1927, the company commenced the manufacture of motors, obtaining the right for Japan to manufacture the Bristol and Lorraine motors.

It has erected a hangar and laid out a flying field at Nagoya, where test flights as well as test operation of motors are conducted. The company employs about 150 staff technicians and 1,800 operatives. Its Funakata properties cover 35 acres, with buildings occupying a floor area of 10 acres.

This company has supplied a number of different types of aircraft to the Japanese Naval Air Service, which include flying-boats, training aeroplanes, reconnaissance seaplanes and fighting aeroplanes. They have also built a mail-carrier for the Department of Communications which has been in service on the air routes of the Japan Air Transport Co., Ltd. They are also building several new types with improved performances.

The Aichi AB-1

Type.—Two-seat mail or four-seat commercial land-plane, convertible to a seaplane.

Wings.—Unequal-span, single-bay, staggered biplane. Top wing carried above fuselage on a system of steel-tube struts in the form of a "W" when viewed from the front and an "N" when seen from the side. One set of "N" type interplane struts on either side of fuselage. Wings taper in thickness from roots to tips and are of wooden construction, covered with fabric. Long, narrow cord tapering ailerons on top plane only.

Fuselage.—Rectangular section. Wooden framework, covered with plywood.

Tail Unit.—Normal monoplane type. Balanced rudder and elevators.

Undercarriage.—Divided type. Consists of two steel-tube V's, with crossed axles hinged to the bottom longerons of the fuselage. Wheel undercarriage interchangeable with float base.

Floats.—Twin, long, single-step floats, of all-wood construction, attached to the fuselage by a system of steel-tube struts in the form of a "W" when viewed from the front and an "N" when seen from the side.

Power Plant.—One 450-h.p. Aichi-Lorraine-Dietrich "W" type water-cooled engine, with a frontal radiator. Main fuel tank in top plane center section.

Accommodation.—Mail compartment immediately behind engine fireproof bulkhead. This compartment may be arranged to accommodate two passengers. Behind the compartment are tandem open cockpits for the crew of two, the front cockpit being under a cut-out top plane trailing-edge.

Dimensions.—Span, 15.11 m. (49 ft. 7 in.); length (land plane), 9.9 m. (32 ft. 6 in.); length (seaplane), 11.266 m. (37 ft.); height (landplane), 3.73 m. (12 ft. 3 in.); height (seaplane), 4.65 m. (15 ft. 3 in.); wing area, 59.2 sq. m. (537 sq. ft.).

Weights and Loadings (Landplane).—Weight, empty, 1,680 kg. (3,796 lbs.); disposable load, 1,030 kg. (2,266 lbs.); weight, loaded, 2,710 kg. (6,062 lbs.); wing loading, 45.7 kg./sq. m. (9.5 lbs./sq. ft.); power loading, 6.03 kg./h.p. (13.26 lbs./h.p.).

Weights and Loadings (Seaplane).—Weight, empty, 2,030 kg. (4,466 lbs.); disposable load, 1,030 kg. (2,266 lbs.); weight, loaded, 3,060 kg. (6,732 lbs.); wing loading, 51.7 kg./sq. m. (10.55 lbs./sq. ft.); power loading, 6.8 kg./h.p. (15 lbs./h.p.).

Performance (Landplane).—Maximum speed, 195 km. h. (121 m. p.h.); minimum speed, 78 km. h. (49 m.p.h.); climb to 3,000 m. (9,840 ft.), 24 mins.

Performance (Seaplane).—Maximum speed, 180 km.h. (112 m.p.h.); minimum speed, 80 km.h. (50 m.p.h.); climb to 3,000 m. (9,840 ft.), 40 mins.

Kawanishi Kokuki Kabushiki Kaisha

(The Kawanishi Airplane Works, Ltd.)

Naruo Works : Daito, Naruo, Muko-gun, Hyogo Prefecture.
Kobe Works : No. 5 Itchome, Wada-Yamadori, Kobe.
Established : November 1928.
Capital : Y.5,000,000.
Business : Manufacture of war and commercial airplanes and parts thereof; wooden and metal propellers.

OFFICERS :—

Managing Director : R. Kawanishi.
Directors : K. Kawanishi, S. Kurose, S. Takao, S. Shimizu, S. Banto.
Inspectors : J. Inouye, K. Nishioka.
Counsellor : S. Kawanishi.
Adviser : T. Yoshida.
Engineer-in-Chief : R. Arisaka.

The Kawanishi Kokuki (Flying Machine Company) was established on November 5, 1928, with the capital of Y.5,000,000 to take over the works of the Flying Machine Section of the Kawanishi Aeroplane Manufacturing Company. In December of the same year the company was selected to manufacture aeroplanes for the use of the Japanese Navy.

The enterprise was originally started in 1918 at Ota Machi, Gumba Prefecture, with a capital of Y.750,000, the first of its kind in Japan. The first machines constructed (five in number) encountered numerous difficulties, but as these were overcome the company was awarded contracts by the War Office to supply machines for the Army.

The company was dissolved some time afterwards, and a private factory was established at Kobe under the title of the Kawanishi Machine Manufacturing Works in February 1920.

Three years later, in June 1923, with the object of putting planes manufactured at this factory to practical use and test, the Japan Aviation Company, with a capital of Y.2,000,000, was organized. This company undertook transportation enterprises, devoting its energies to the development of commercial aerial navigation. The Kawanishi Works, finding it imperative to conduct further studies of aerial dynamics, established a laboratory in 1926. Through these experiments the predecessor of the present company achieved the construction of scores of both land and water planes for civil as well as for military uses, which have given excellent results.

The company has been selected by the Japanese Navy to undertake the construction of naval planes. With the increase of orders from the Navy, and for the purpose of exerting its utmost in the construction of flying-boats of a larger size, this company has purchased over 60,000 tsubo on the seashore at Naruo, of which some 20,000 tsubo was reclaimed last year, and a new factory was constructed in December last. This company has a plan to extend its works in order to discharge orders more promptly and to turn out better machines in future.

The company will concentrate on the construction of large type stainless steel flying boats for the Navy. The large naval flying boat, built by Short Brothers & Co., of Rochester, England, which recently arrived in Japan, will be delivered to the Kawanishi works, which has a working agreement with the English firm. This new naval boat is to be named the Kawanishi Flying Boat No. 1.

The Kobe works will be retained as machine works. The wind tunnel, the only one of its kind maintained by a private concern in Japan, will likewise be retained there, together with the Sakura machine, fitted with 650 h.p. B.M.W. motor, completed by the Kawanishi works three years ago for the proposed trans-Pacific flight sponsored by the Japan Aviation Society.

The Ishikawajima Aircraft Company, Ltd.

Head Office : 6, Marunouchi, Itchome, Kojimachi, Tokyo.
Works : Tokyo Works: 7, Kuchome, Kyobashi-ku, Tokyo, Tachikawa Works: 3,628, Tachikawa-machi, Tokyo.
Business : Designing, manufacturing and selling aeroplanes, chassis, aero-engines and accessories.
Products :. Reconnaissance machines, training machines, sporting machines, fighters, and Cirrus aero-engines.
Capital : Y.2,000,000.
Board of Directors : President: T. Shibusawa. Directors: T. Arikawa, K. Shibuya, S. Kamada, M. Shibusawa, U. Yamada, K. Katsu and T. Nakamura. Advisers: H. Okawa and J. Kadono.

Of all the companies comprising the Japanese Aircraft Industry none has made so rapid a rise as the Ishikawajima Aircraft Company, Ltd. (Kabushiki Kaisha Ishikawajima Hikoki Seisakusho), which entered the aviation field in 1924.

The company was formed by eminent business men who foresaw that the aircraft industry would play an important rôle in the sphere of communication and national defence.

In 1925, amidst great enthusiasm and high hopes, the Ishikawajima group started work at Tsukishima, Tokyo, engaging experienced engineers and workmen from the army, navy and civil works.

To complete the organization, a considerable change took place in the technical and business departments with the engagement of Dr. Lachmann (the famous inventor of the slotted wing), of the Albatross Flugzeugwerke G.m.b.H., as technical adviser.

A site of seven hectacres was acquired near the Military Aerodrome at Tackikawa on which to erect the factory to design and manufacture all kinds of military and civilian aeroplanes, and in 1928 the company was authorized by the Imperial Army to manufacture military planes.

With the expansion of its business, the company obtained the option of manufacturing and selling in Japan of the Handley Page Ltd., England, slotted wings, and also the manufacturing and selling rights of the Cirrus aero-engines and of N.K.F. radiators.

Constant efforts have been made for improving the products, which are now generally admired as of excellent quality and exceptional performance.

The company has concentrated its activities in advancing civilian aviation, and has built the Ishikawajima light plane, which has attracted the attention of the aerial world towards its work.

The *Asahi*, the biggest newspaper in Japan, selected the Ishikawajima for their news service.

The Japanese Students' Aviation League adopted the plane after a strict investigation, and the machine is now being prepared for its flight to Europe.

Tokyo Gas Denki Kogyo Kabushiki Kaisha

(The Tokyo Gas Electric Industrial Co., Ltd.)

Head Office : No. 100 Iriyamazu, Iriaraimachi, Ebara-gun, Tokyo Prefecture.
Omori Factory : No. 100 Iriyamazu, Iriaraimachi, Ebara-gun, Tokyo Prefecture.
Gunpowder Factory : Kita Toshima-gun, Tokyo Prefecture.
Toranomon Office : No. 4, 2-chome, Uchisaiwai-cho, Kojimachi-ku, Tokyo.
Established : August, 1910.
Capital : Y.6,000,000; Y.5,250,000 paid up.
Business : Aero-engines, marine engines, military armored automobiles, fire-fighting engines, meters of all kinds, machine tools, electrically-driven hoists, machine-guns, gunpowder, etc.

The company started the manufacture of aero-engines during 1918, in those days considered as one of the most difficult enterprises in Japan, and has since taken the lead in this particular field.

At the beginning of its career the company sent a number of selected engineers to the Tokyo arsenal to study the technique

(Continued on page 253).

Progress of Wireless in Java

By A. J. MILLING-JONES, M.A.

ALTHOUGH it is scarcely fifteen years since the first radio station was erected in Java, wireless communication there has made amazingly rapid progress so that to-day Java is able to talk direct to both Europe and America. The history of the development of the Malabar radio installation near Bandoeng, in central Java, speaks eloquently of this progress. In 1917, Dr. Ir. De Groot returning to the East Indies from Holland began with the erection of a receiving installation borrowed from the "Telefunken" Company and when this was completed it became obvious that messages could be received from several European and American transmitting stations. Special observations were taken and then deductions were made about the power and wave length necessary for transmitters. The next task confronting the originator of the idea that a direct and wider wireless communication between Java and the rest of the world was technically possible, as well as politically necessary, without reliance on intermediary relaying stations, was to get more data. Once the site of the Malabar mountain was selected for this purpose, it was vital to success that the very best provisional equipment procurable should be used in making further experiments. To this end a small system was built up with the aid of an electric dynamo and an airplane motor of 125 h.p. and a temporary antenna was constructed in the cleft of the mountain. From March 1918 onward, signals were sent out regularly and from time to time various improvements were made and eventually a new dynamo was purchased in Japan. Even so, communication with Europe was not yet good enough to warrant a regular traffic over the greater part of the day as stronger transmitters were required for really first class results to be possible. A big arc transmitter of 2,400 kw. primary power was made in the East Indies from Dr. De Groot's designs and placed in the great central building at Malabar, where there was also room enough for a second big arc transmitter, two 200 kw. arc transmitters, a small spark transmitter and a Telefunken alternator-transmitter of 400 kw. antenna power. Two new antennæ were constructed, the largest of which reached right to the very back of the mountain cleft. Everything was now in readiness in Java but as yet there was no good receiving station in Holland. However a complete receiving set was made in the workshops of the Telegraph Service at Batavia and (since the great European war was scarcely over) the set was placed aboard H.M. armoured cruiser *De Zeven Provincien* of the Dutch Royal Navy and taken *via* the Panama Canal to Holland. During the voyage the signals of Malabar station were regularly picked up until the man-of-war reached the Atlantic Ocean where for special reasons they were discontinued. The communication however had been eminently satisfactory over more than half of the earth's circumference.

As soon as it arrived in Holland the receiving set was put up at Blaricum near Amsterdam and in the favorable hours of the day the signals of Malabar were heard. All day and both way communication had yet to be established but in January 1923 the transmitting station Kootwijk in Holland was finished and four months later (May 5, 1923,) communication with Holland was opened officially and in the years immediately following with many other countries also.

Malabar Radio Station, Bandoeng, Java

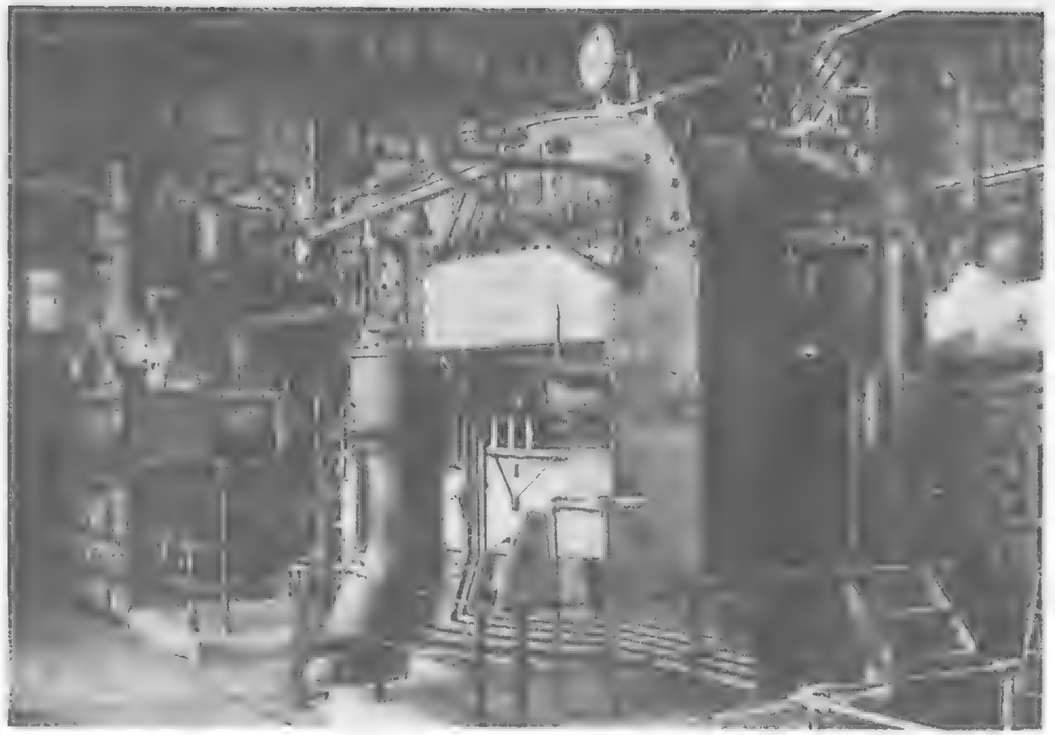
One of the greatest problems at this time in the progress of wireless development was that of wave-length. In spite of the more powerful transmitting apparatus, expectations were not completely answered. There were many points at which communication was far from perfect and all over the world ceaseless experiments were being made and new theories tried-out in the hope of the best results. A wireless chief's work is never done, but by 1925, it seemed, everything that could be done had been done and yet there was a fairly large margin for error. A standstill had almost been reached when in 1926 the short-wave made its revolutionary entrance into the wireless world. Little time was lost in testing out this new discovery in Java and in the laboratory of the radio-service at Bandoeng the idea was gradually evolved from a chrysalis stage to one of perfection. So it was that in 1927 an altogether new period commenced in Javanese radio development.

Hitherto the transmitters used had all been based on the long-wave system but soon short-wave transmitters were rendering valuable telephonic and telegraphic assistance and were giving reliable if not actually magnificent results. It appeared desirable to put more of these transmitters for telegraphy and telephony at Malabar as they were proving so efficient so, in order to make the necessary room at Malabar, the old 100 kw. arc-transmitter was transported to the Museum of the Post and Telegraph service at Bandoeng. Incidentally here also had been placed the historic receiving set of H.M. *De Zeven Provincien*. One of the 200 kw. arcs was transported to Tjililin station, to the west of Bandoeng, where a much smaller installation had been tried out as far back as 1918. In this way, it was possible to place four short-wave transmitters with the necessary additional parts in the transmitter hall. A fifth transmitter was erected in what was originally the workshop and a separate building erected to take its place.

At first the short-wave aerials were hung on the wooden towers which were also used to fix the wires of the great mountain antennæ. But the close proximity of the

Front of Malabar Radio Station, showing Aerials

Arc Transmitters of 200 and 2,400 kw.

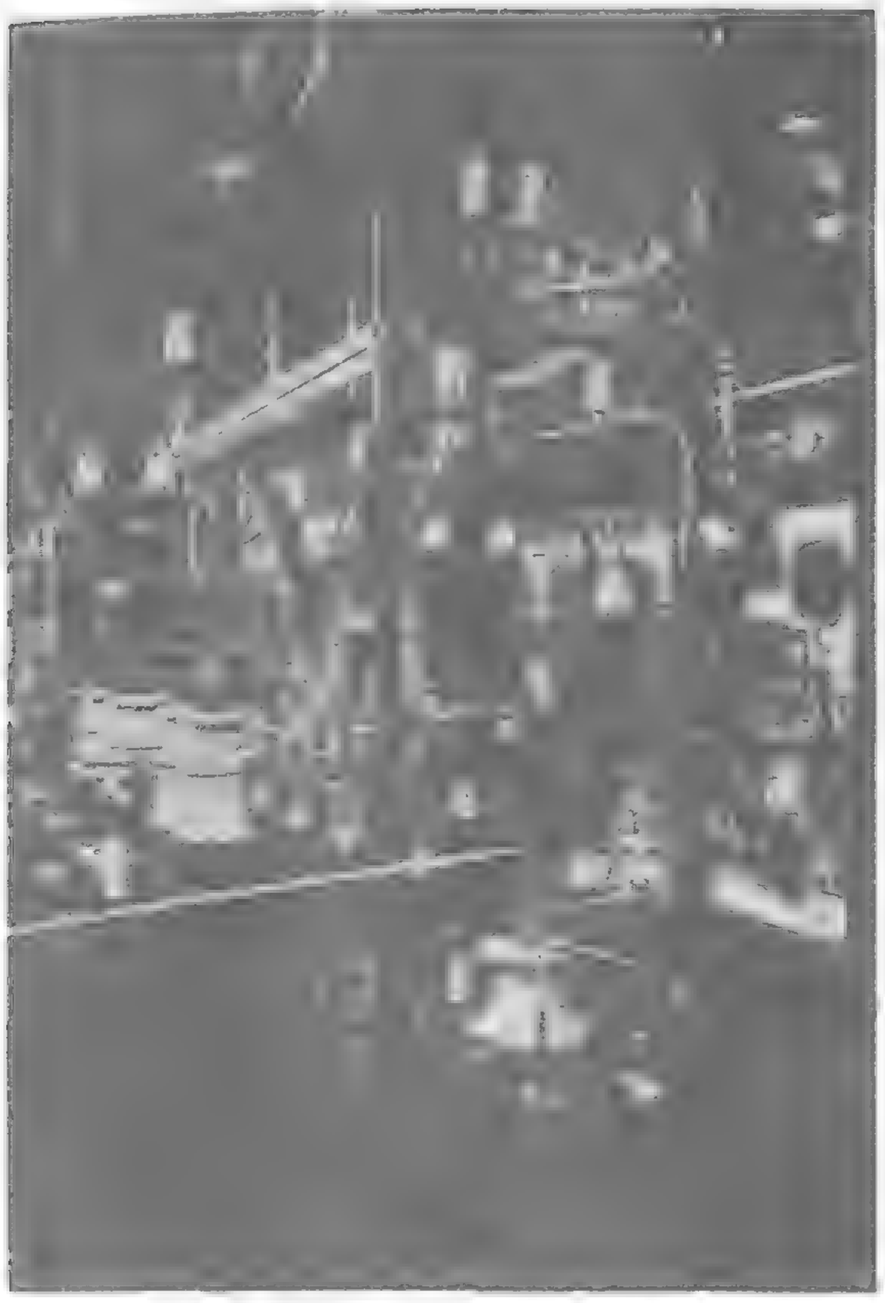


Transmitting Hall at Malabar

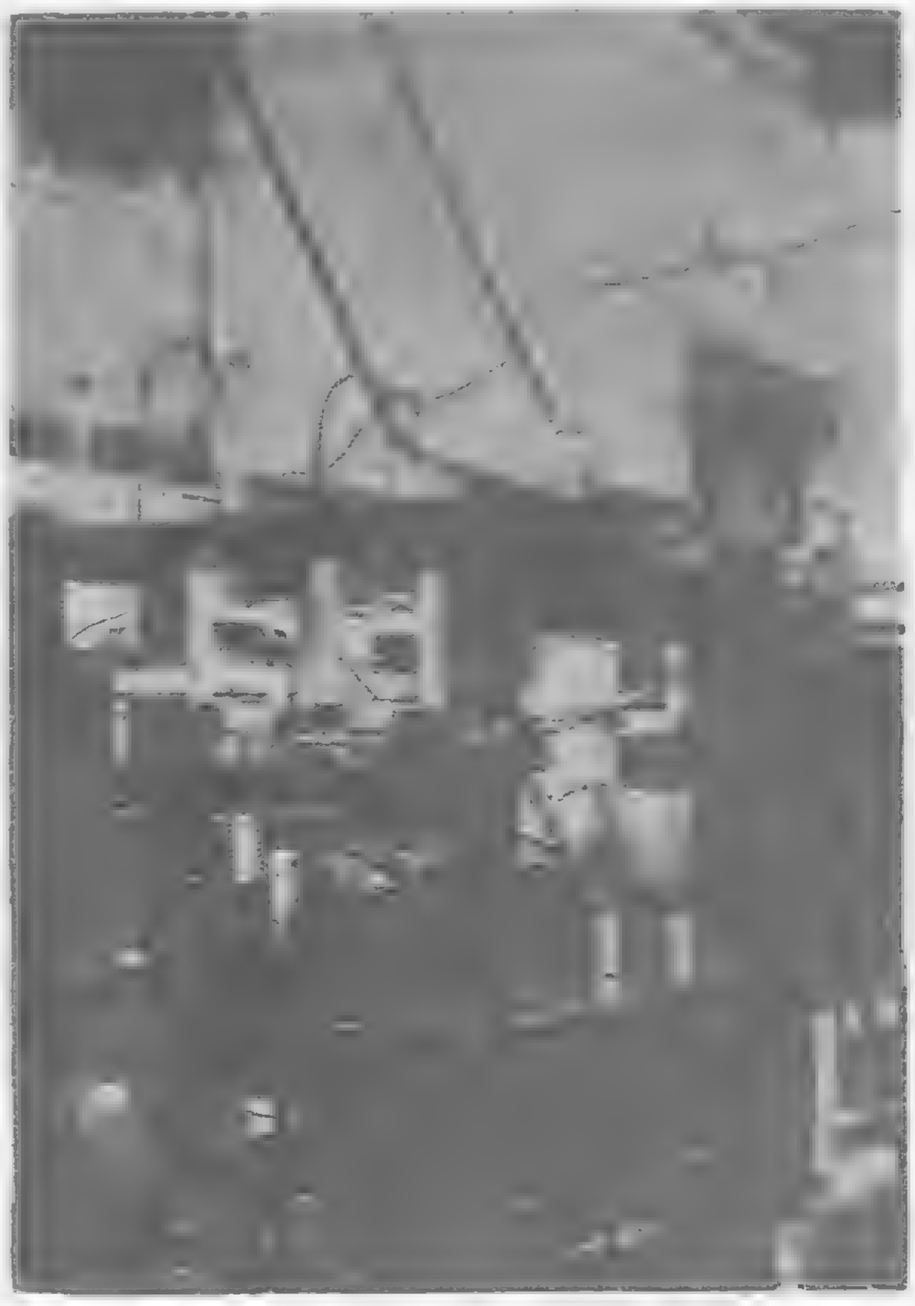
Two Great Arc Transmitters of 2,400 kw.

Machinery Gallery with Control Tables and Switchboard

Telefunken High Frequency Alternator Transmitter



View in Malabar Transmitting Hall



Short Wave Transmitter; Side View

long-wave and short-wave aerials caused trouble. Moreover the place of the aerial wires and aerial coils close to the wooden towers and roof was dangerous in the case of fire. For these reasons an iron framework 25 meters high was erected behind the main building and a small separate structure built for the coils so that the front side of the main building was left completely free for the short-wave aerials. By the end of 1928 a brand new short-wave transmitter of great power was projected with two beam antennæ for different waves.

antennæ and the installations for electric power-supply. One of the power stations is situated near the main entrance and the other about half way between it and the main building.

In all there are four water-power stations and one station with steam engines. In each case, the energy is transferred as a three phase current of 50 cycles, a 25,000 volt tension being provided by the electrical power station of the Governmental Service for water-power and electricity. The long overhead line connecting the five stations supplies the whole plateau of Bandoeng with its electrical energy and four sets of three lines connect the electric power stations north and south of Malabar. All of these are well protected from storms one of the worst hindrances in the early days of wireless. Nowadays special lightning arresters consisting of horn-gaps and resistances have been evolved and the great importance of these can easily be understood when it is realized that formerly even a very small thunderstorm would sometimes seriously upset transmission for many hours. The lines are also connected to oil circuit breakers and to the 25,000 volt bus-bars of the transformer station. A high tension protector has been provided and voltage transformers are mounted in behalf of the measuring instruments and protecting arrangements.

In separate cells three transformers of 2,000 kw. three phase 25,000/6,000 volt are mounted and there is one cell available for a fourth spare transformer. The primary circuits of the transformers are connected to 25,000 volt bus-bars, the secondary circuits to 6,000 volt bus-bars and two 6,000 volt underground cables lead the energy to the main building. On a switchboard are mounted the instruments for the selective protection of the outdoor lines and the differential protection of the transformers so that in case of a disturbance on the outdoor line the faulty line is automatically disconnected and a spare line is immediately put in function by the selective protector arrangement. A breakdown in the interior of a

The drastic change brought about in wireless development throughout the world is aptly reflected in the station at Malabar now probably the most up-to-date wireless transmitting station in the Far East. The site alone is indisputable. As already mentioned the station is erected in the cleft of a mountain, with mountain ridges on both sides and a wealth of tropical foliage above and below. While staying with friends in Java I visited the place and was shown round it by that most excellent Chief, Mr. D. C. Nopper, who was kindness itself and rightly proud of a great undertaking. The whole station is housed in different buildings, namely the central building where the transmitters and machines are placed, the transformer station, a workshop, two small water-turbine power stations, new buildings for the separate beam transmitters in front of the place and several storehouses and booths. There are also dwelling houses for the chief, the officials in charge of the various departments and the other employees. Seen through the lifting mist the grey roofs of the happy little colony present a pleasing and romantic spectacle as they nestle in a close cluster on the side of Mount Malabar. The towering height of the mountain dwarfs distance as one approaches for actually the main building is nearly a mile from the entrance.

Between the transformer station and the five towers of the central building is a small storehouse and to the left on the slope of the mountain are the cooling installations, the

Short Wave Transmitter at Malabar; Front View

transformer is unlikely but should this by any chance happen the transformer in question is automatically disconnected on *both* sides. At any instant the energy can be read on a self-recording kilowatt meter.

Two small water power stations form a reserve for current supply in case of a total break-down. Mountain-river water is used here. The Tjigeureuh has been dammed up and conducted to a clarifying reservoir where the sediment is precipitated. Then it runs through a small channel and an open canal to the first grate reservoir whence passing down a wooden pipe it enters the first power station where a water-turbine 200 h.p. and a direct coupled dynamo are installed. Finally the water is conducted to a second large reservoir and runs in a small wooden pipe to a second small water power station where a water-turbine, this time of 300 h.p. is mounted, driving a dynamo. The electric machines of both these stations are equal namely 250 kva. 6,000 volt 3 phase, 50 cycles.

Tjililin Transmitting Station

which are loaded by the machines. The four big motor-generators each with a 3 phase alternating current motor of 1,760 h.p., of 6,000 volts, driving two direct current machines of 612 kw., 1,760-2,000 volts each, were delivered by the International General Electric Company. These two dynamos are connected in series and provide the direct current for the great arc transmitter. When working in parallel two of these sets provide 2,400 kw. by a tension of 3,500-4,000 volts.

Other machines aiding the electric energy of the transmitters are two motor generators, a rectifying motor, two 750 volt motor for the upper magnet-coil of the great arc and two 500 cycle rectifying motors, as well as four smaller motors for direct current supply and battery loading. On the machine gallery are placed the control desks of the different transmitters including the chief's control-desk where the official in charge can control the whole service and look over the whole of the transmitter room.

Transmitting Hall at Tjililin

Short Wave Transmitters with Machines at Tjililin

The two cables which conduct the energy from the transformer station to the central building are connected to the 6,000 volt bars of the main switchboard. By means of two other cables two transformers of 250 kva. 6,000/220 volt, 3 phase, 50 cycles are connected mounted in the cellar underneath the switchboard. They give their secondary energy to the 220 volt bus-bars of the main switchboard.

Besides the 6,000 volt and 220 volt 3 phase current, direct current of 110 volt is available being provided by motor generators or a battery of accumulators of 360 ampere-hours capacity

Of the eight transmitters perhaps the most interesting is the great arc transmitter of 2,400 kw. a photograph of which is shown here. This, it is claimed, is the largest in the Eastern Hemisphere. The weight of the magnetic circuit alone is 184,000 kg., and the bronze arc chamber weighs 4,000 kg. Additional pieces weigh 6,500 kg. The magnetic field is obtained by an oil-cooled coil within a tank at the lower side and an air cooled coil on the upper side of the arc chamber. The weight of the lower coil is 6,000 kg. and of the upper coil 14,000 kg. The attractive power of the two iron cores is 60,000 kg.

Telefunken H. F. Alternator and Switchboard at Tjililin

Telefunken Alternator Transmitter at Tjililin

Receiving Station at Rantja-Ekek

Receiving Installation at Rantja-Ekek

Working on a wave-length of 15,600 meters the ordinary tension is 2,600 volts the primary current being about 700 amperes and the aerial current about 500 amperes. If it is desired, wave-lengths of between 7,800 and 18,000 meters can also be used.

The parts of this great arc transmitter were built entirely in the East Indies according to the designs of Dr. De Groot. The parts of the second great arc transmitter were made in Europe most of them being supplied by the Feyenoord Company of Rotterdam. The arc chamber was made by the Vulkan Werke at Stettin. Besides some constructional improvements this arc transmitter is equal to the first though the iron magnetic current could be of a more simple construction.

For signalling, a coil can be inserted in the antenna circuit. Coupled with it are 36 secondary windings which can be closed or opened by means of specially designed pneumatic relays. But when working on a 15,600 meter wave-length only 24 relays are needed for the necessary tuning difference. In the second great arc transmitter there is a further arrangement for signalling with triodes which can be used for slow, medium, rapid and very high speed signalling.

Of the five short-wave transmitters two are arranged for telegraph and telephone. They have one wave-length only and possess a common modulation and signalling device which means that they cannot be at work at the same time. The remaining three transmitters are for telegraphic work only. They share two signalling arrangements and a considerable speed-up is thus obtained as two out of the three can work simultaneously.

The Telefunken high-frequency alternator transmitter is mounted in a separate part of the building. It consists of a high frequency alternator for 5,000 cycles, driven by a 3 phase motor and the static frequency changes with the tuned circuits. It can work on wave-lengths of 7,800, 10,400, 15,600 and 20,800 meters and signals are obtained by means of a coil. In this instance the control desk is in the middle of the hall and an automatic speed regulating arrangement is provided.

Among the more modern installations at Malabar there are five antennæ for short waves and two beams are being constructed on a separate front. The short wave aerials are hung on steel wires fastened in front of the wooden towers to the steel masts which were formerly used for the great mountain antenna. They all consist of two horizontal stranded copper wires (IImM thick) except the aerial for Plf at 16,8 wave-length which has two pairs of bronze reflector wires 3½ mM thick as well as active antenna wires.

Besides the equipment mentioned above four antennæ for long-waves, an ingenious water-cooling device and several additional arrangements including electrolytic hydrogen generators which supply the arc transmitters, deserve special notice. The heated water is drawn off into a reservoir slightly to the left of the main building where it is partly cooled by surface cooling. Spraying which is the art of reducing the temperature of the water to a minimum is conducted by contact with the air at a higher level reservoir. The water is pumped up by electricity. It falls in a number of thin sprays and is led back to the arc through pipes and filters.

The success of the Malabar radio station is a complete and empahatic triumph for its designer, but Dr. De Groot was not permitted to see these magnificent results. He died on August 1, 1927, on his way to the Washington Radio Conference of that year. Even now, however, there are many points requiring careful attention and further experiment. There is always much to be done to keep a radio installation up-to-date and in the best possible condition. As soon as the latest machines are in working order their lessons must be learnt, classified, and stored away against the time when a still newer experiment will be attempted. For in the near future radio-vision is to be expected.

Transmitting Hall

Receiving Hall

Radio Central at Bandoeng

One of the Locomotives of the Kanhoku Line of the Chosen Railway Company: Gauge .762m; Weight 30 M Tons

Private Railways in Chosen

HISTORY.—It is not long since private railways in Chosen have been in successful operation. Generally speaking, when the traffic returns began to assume a promising aspect, these railways had to face a number of difficulties arising out of the unprecedented economic depression. However, thanks to the combined efforts of the Government and people who were of the opinion that railway enterprise was most urgent and fundamental for the development of Chosen, the difficulties were finally overcome, with the result that the traffic on all the private lines began steadily to improve, and their extension made good progress, as shown in the following table :—

1921	for 3 lines	66.4 km	1926	for 2 lines	37.0 km
1922	3 lines	86.8 km	1927	4 lines	104.3 km
1923	4 lines	116.5 km	1928	3 lines	74.3 km
1924	4 lines	103.9 km	1929	5 lines	137.3 km
1925	4 lines	106.6 km	1930	6 lines	251.9 km

The total length of the lines open to traffic at the end of January 1931, was 1,072.7 km.

Ownership of Lines

At the end of 1930, there were eight private companies operating railways in Chosen, with one licensed corporation which has not yet begun construction work :

Chosen Keinan Railway Co.
Chosen Gas Electric Co.
Kongosan Electric Railway Co.
Kaisen Railway Co.
Shinko Railway Co.
South Chosen Railway Co.
Chosen Keito Railway Co.
Chosen Railway Co.

Some of these railways are of a 1.435 meter gauge and others of 0.762 meter. The length of the standard gauge lines totals 706.3 km. and that of the latter, 366.4 km. Electric power is used by the Chosen Gas Electric Co., and the Kongosan Electric Railway Co. All the other railways use steam power. Gasoline cars are also in service on certain sections of these lines.

Rails of 60 lbs. are used on the standard gauge lines and from 20 to 45 lbs. on the narrow gauge lines.

Subsides

The Government has been so keen and interested in developing railway communications that, in order to supervise and protect them, it enacted in 1912 the necessary regulations and granted special subsidies for 15 years, whenever the percentage of the annual profits to the annual revenue be less than 8 per cent. All the above railways except the Chosen Gas Electric Co., have received this assistance.

THE CHOSEN RAILWAY CO.—This Company, operating the longest railway in Chosen, has its head office in Keijo and a branch at Tokyo.

Its lines are divided into the following sections :—

THE CHOHOKU LINE.—This is a standard gauge steam-powered line branching off from Chochiin, on the Keifu Main Line of the Government Railway, and extending east 94 km. to Chushu.

Locomotive of the Kokai Line of the Chosen Railway Co.

THE KEIHOKU LINE.—A steam-power standard gauge railway with a total length of 85.3 km. It starts from Kinsen, on the Keifu Main Line, and terminates at Reisen. An extension from Reisen to Anto, 71.1 km. is under construction, and will be completed in the course of this year.

THE KEINAN LINE.—A standard gauge steam-power line 70 km. in length, starting at Masan, the terminus of the Masan Line, and terminating at Shinshu.

THE KOKAI LINE.—This line operates both steam trains and gasoline cars. It branches off at Shariin, on the Keigi Main Line, and extends to Kaishu, the capital of Kokai province. The line has several small branches. The total length is 130.9 km. and its gauge is of 0.762 meter. There are other branch lines now under construction which will be opened to traffic by next year at the latest. A popular hot spring at Shinsen, six hours from Keijo, attracting many visitors all the year round, is reached by this line.

Electric Car on the Kongosan Electric Railway

Gasoline Car on the Kanan Line of the Chosen Railway Company. Gauge, .762m; Seating Capacity, 60

Standard Gauge Gasoline Car for the Keinan Railway built by the Ryuzan Manufacturing Company, Oct. 1930; Motor, 68 h.p. Buda; Seating Capacity, 53 persons: Weight 15 Tons

THE KANNAN LINE.—This is a narrow gauge line operating both steam and gasoline cars which starts at Kanko, on the Kankyo Line, and terminates at Kannanshinko. It has two small branches one starting at Goro and terminates at Jotsu, and the Choho branch. The total length of these lines is 56.9 km.

THE KANHOKU LINE.—This 0.762 meter gauge steam line branches off at Mosan on the Kankuo Line, and extends to Komosan on the Tomon river. The length of the line open to traffic is 60.1 km.

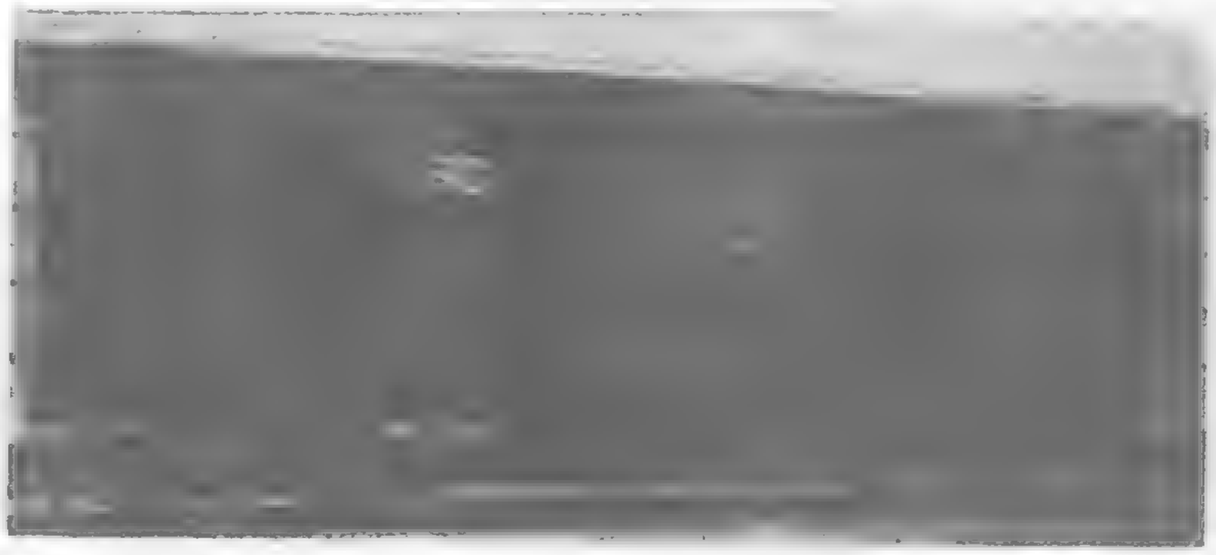
The length of all the Chosen Railway Company's lines open to traffic is 497.2 km. of which, 249.3 km. are of standard gauge, and the rest, narrow gauge.

THE KONGOSAN ELECTRIC RAILWAY CO.—This line starts at Tetsugen on the Keigan Line and terminates at Choanji, the starting point to Kongosan or Diamond Mountain, the famous mountain resort. This is a standard gauge line with a length of 108 km. one section of which 8.3 km'. Kongoguchi to Choanji, is unfinished. After the completion of the whole section, which will take place by June of this year, the access to this beautiful mountain will become much easier. Even now, it is an easy journey; one may travel by the through sleeping car from Keijo and return in one day. As the chalet hotel owned and managed by the Government Railway, affords good accommodation, the traveller does not experience any inconvenience.

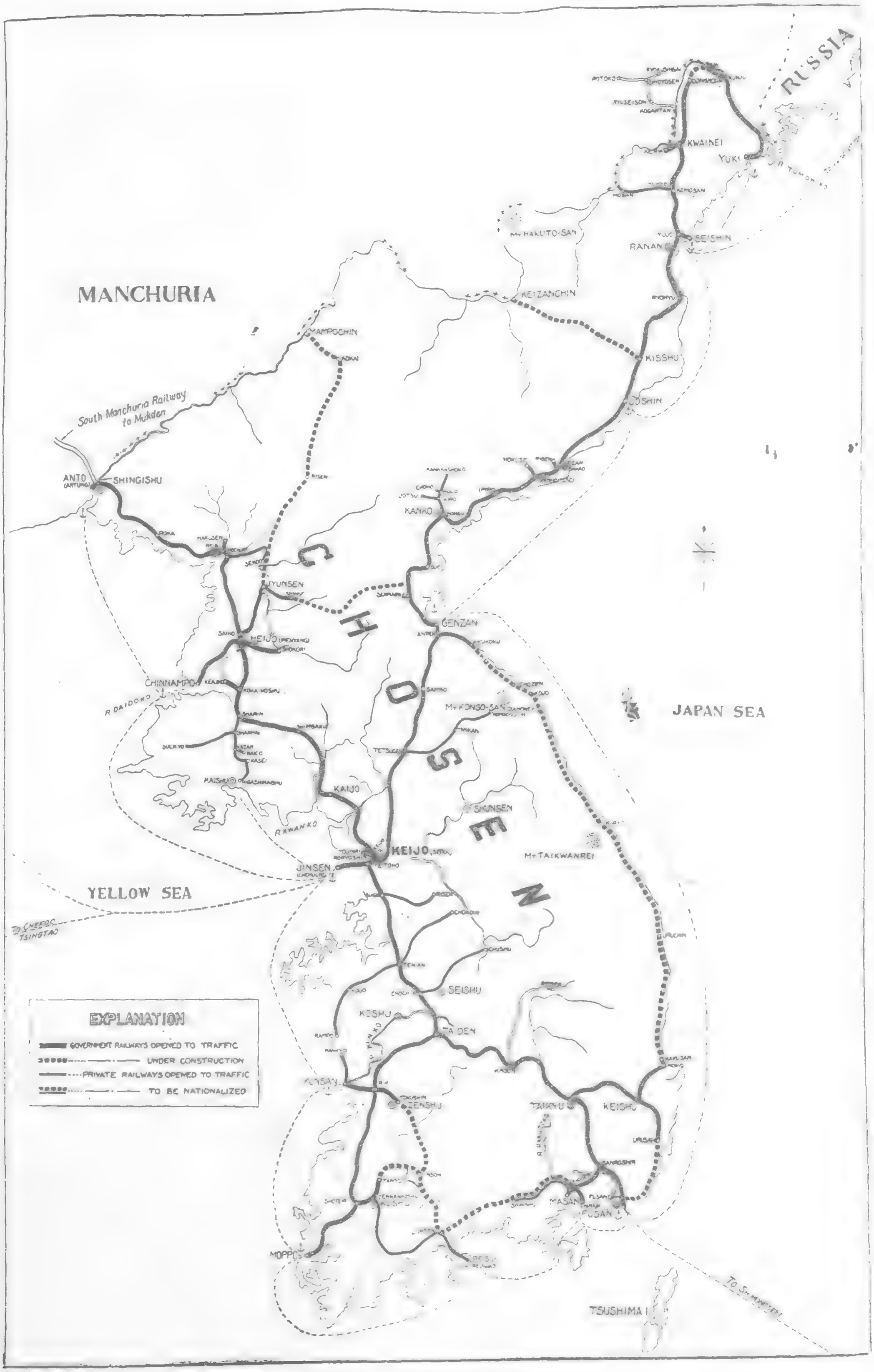
Chudori Hydro Electric Power Station of the Kougosan Electric Railway Co.: 3,250 kw: head 733 feet

THE CHOSEN KEINAN RAILWAY CO.—This is a standard gauge line which starts from Choko, at the mouth of the river Kinko, and extends north to Chokoin, *via* Tenan, on the Keifu Main Line, its entire length being 194.2 km., of which 169.9 km. is open to traffic. The remaining

Third Class Passenger, Baggage and Mail Car built for the Chosen Keinan Railway by the Ryuzan Works: Weight 26 Tons: Seating Capacity, 48



Standard Gauge Freight Car used by the Chosen Kainan Railway


RUSSIA
MANCHURIA
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KEIZANCHIN
KISSHU
SHIN
MAMPOCHIN
KOKAI
South Manchuria Railway to Mukden
ANTO (ANTUNG)
SHINGISHU
RISEN
KANKO
GENZAN
HEIJO (PYENYANG)
SAMHO
CHINNAMPO
KAIJO
KEIJO (SEOUL)
JINSEN (CHEMULPO)
Mt KONGO-SAN
Mt TAIKWANREI
SHUNSEN
SEISHU
KOSHU
TAIKYU
KEISHU
FUSAN
MASAN
TSUSHIMA I.
JAPAN SEA
YELLOW SEA
TO CHEEFOO TSINGTAO
TO SHIMONOSEKI
R. RAIDOKO
R. KWANKO
EXPLANATION
GOVERNMENT RAILWAYS OPENED TO TRAFFIC
UNDER CONSTRUCTION
PRIVATE RAILWAYS OPENED TO TRAFFIC
TO BE NATIONALIZED

section of 24.3 km. Hankyo to Rampo, will be completed in the course of this year. On this line at Onyo is a most popular hot spring, about 30 minutes ride from Tenan on the Keifu Main Line, an ideal and most convenient pleasure resort, reached in 2½ hours, from Keijo.

THE SOUTH CHOSEN RAILWAY CO.—This is a standard gauge steam railway which has a total length of 160 km. The line starts from Reisui, a port on the southern coast, and terminates at Koshu, the capital of South Zenra Province. Gasoline cars are also operated on this line.

THE CHOSEN KEITO RAILWAY CO.—This is a narrow gauge line, 53.1 m. in length, operating both steam and gasoline cars. The line starts at Suigen, a beautiful town on the Keifu Main Line, extends east to Risen.

THE SHINKO RAILWAY CO.—This line 19 km. in length, starts from Kannanshinko, on the Kannan Line of the Chosen Railway Co., and terminates at Kannan Shoko. In addition to steam it also operates gasoline cars.

THE KAISEN RAILWAY CO.—This narrow gauge line with a length of 36.9 km. open to traffic, starts at Shinanshu on the Keigi Main Line, and terminates at Sendo. It operates both steam and gasoline cars. By this line one may visit the great "Toryukutsu" stalactite grotto. Reduced faro tickets are on sale for the return trip at principal stations of the State line.

Railway Bridge over the Chogansen River on the Kongosan Electric Line; Five 60-ft. trusses

THE CHOSEN GAS ELECTRIC CO.—The line operates narrow gauge electric tram-cars between Fusanchin, on the Keifu Main Line, and Torai, a distance of 9.5 km. Torai is one of the most popular hot springs in Chosen, attracting many visitors all the year round.

DAI-KOKU-GUN

(Continued from page 244)

of airplane construction, under the guidance of Government experts, and in a few months started to manufacture, completing the first "D" type 100-h.p. motor in October, 1919. The test proving satisfactory, the company has continued the manufacture thereof. This was the first aero-engine produced in a civilian factory in Japan.

In June, 1921, the company obtained the right to manufacture 80 h.p. and 120 h.p. Rhone motors from the Société de Moteurs Gnome et Rhone, these motors being used for the Army and Navy planes.

In 1921 the company was given a chance to produce the Navy type 130-h.p. motor, and the sample meeting the tests, it has since been awarded frequent orders for the same type. In 1928 the company was given a trial order to produce the Navy 3 type, 150 h.p. motors, which also proved satisfactory.

Kamikaze Motors

Since it started to build aero-engines the T.G.E. has made satisfactory development, the engineers acquiring remarkably advanced technique in this field. The one regret of the company was that its engines, as well as others manufactured in Japan, were merely copies perfected by foreign makers, involving a large sum of money paid out for manufacturing rights.

At the beginning of 1926 the company designed and built an altogether new engine which, after 50 hours' test conducted in 1929, passed the strict requirements of the Department of Communications with honors.

The motors are of the Star type, air cooled with 9 cylinders, 7 cylinders, and 5 cylinders, developing 150 h.p., 130 h.p., and 90 h.p., respectively. Of these three types the company first completed the 130 h.p. motor at the end of 1928, and passed the tests of the Department of Communications during the following year.

Its patriotic service in producing a national aero-engine was publicly acknowledged, and a letter of appreciation, together with a pair of silver cups, were presented to the company in the name of the Minister of Communications in May, 1929. The engine was called the "Kamikaze" ("God Wind"), the name being taken from the episode in the historic invasion of Japan by the Mongols during the Kamakura era, when what is called the "God Wind" destroyed all the Mongolian ships off the Kyushu coast.

Kabushiki Kaisha Watanabe Tekkojo

(The Watanabe Iron Works, Ltd.)

Head Office and Factory: No. 28, 2-chome, Chiyomachi, Fukuoka.
Established: January, 1886 (reorganized into a joint stock company in April, 1919).
Capital: Y.1,500,000.
Business: Naval and military arms and parts thereof: airplane parts: oil engines; Asakawa type charcoal gas producer, and various other machinery.

This company was appointed purveyors to the Navy in 1921 for supplying aeroplane wheels, and in 1930 it was ordered by the Navy to manufacture aeroplanes and has erected a Y.500,000 factory near Fukuoka city, with a capacity to build 100 machines a year. It will begin with fuselage construction, and is already planning to produce motors. A characteristic of these works is that its products will be made entirely with materials obtainable within Japan.

Other Companies

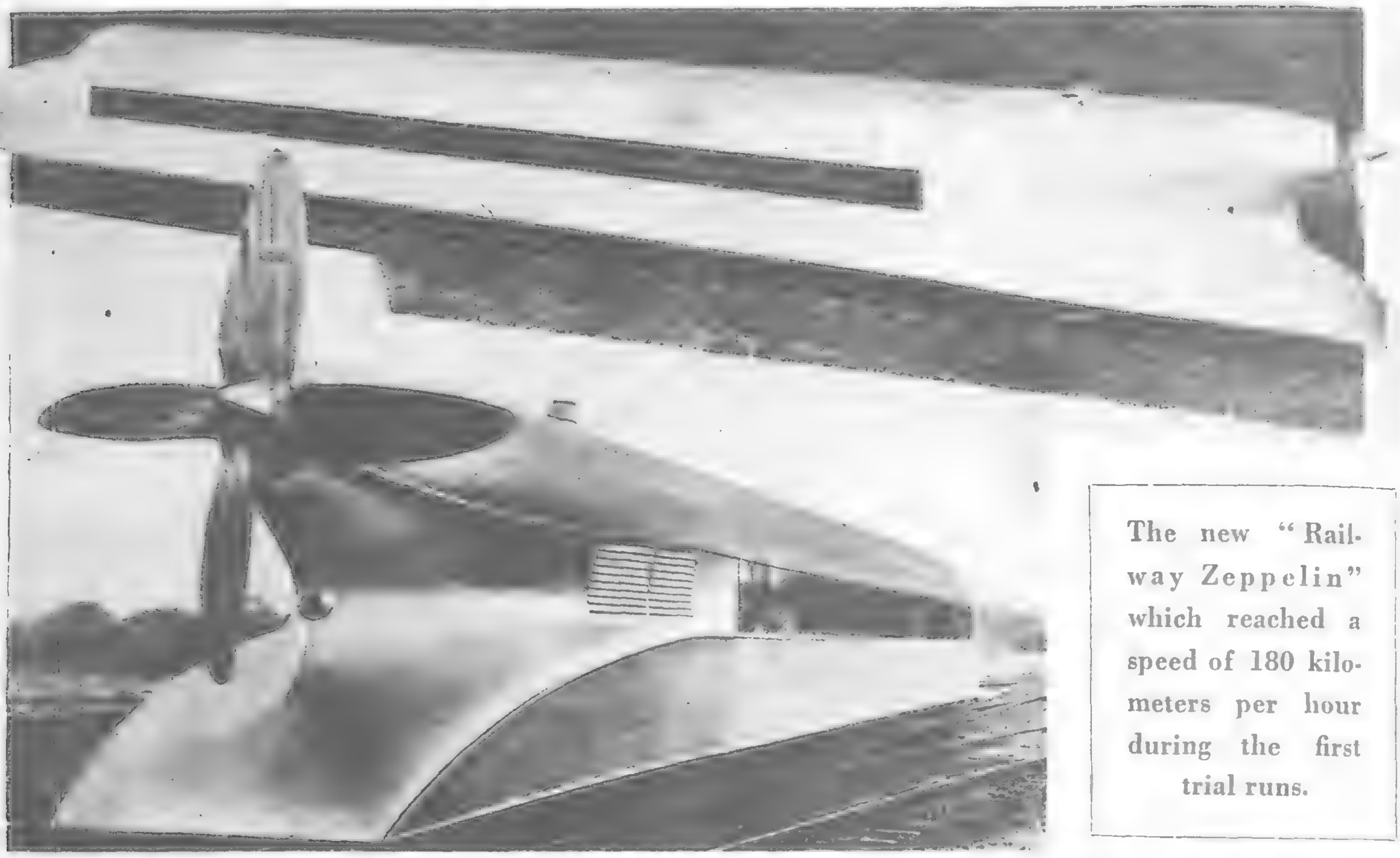
In addition to the foregoing eight representative aeroplane and aero-motor manufacturing companies there are several other companies engaged in the manufacture of parts and supplies. Included among these are:

Fujikura Kogyo Kabu-hiki Kaisha

(The Fujikura Industrial Co., Ltd.) of Tokyo, capitalized at Y.1,000,000, with Y.700,000 paid up. Produces airships and balloons;

Tokyo E. C. Tokgyo Kabushiki Kaisha

(The Tokyo E. C. Industrial Co., Ltd.) of Tokyo, capitalized at Y.1,000,000. Also produces rubber varnished cloth for balloons, poison masks, parachutes, and other aeronautical supplies.



The new "Railway Zeppelin" which reached a speed of 180 kilometers per hour during the first trial runs.

The German "Zeppelin on Rails"

Much interest has been aroused throughout Germany and the rest of the world by a so-called "Zeppelin on rails," which recently completed successful trial runs. This vehicle, which is propelled and operates on standard railway track, is being hailed as one of the practical means of high-speed transportation of the future.

The development of this invention is the work of two engineers, Franz Kruckenberg and Curt Stedefeld. The car itself was constructed by the Association for Technical Research in Transportation (Gesellschaft fuer Verkehrstechnik), which was founded in 1924 in Heidelberg. During the past few years exhaustive experiments have been conducted with a view to developing faster means of transportation. Much assistance has been given by the German State Railways, which placed a workshop and a stretch of track for experimental purposes at the disposal of this organization. The first experiments were made with propeller-driven cars suspended from a monorail. Considerable success was achieved in preliminary tests, but further development was hampered through lack of necessary capital. As a compromise, the inventors turned their attention toward the development of propeller-driven cars for operation on ordinary railway track.

Results of Tests

The first tests were made in October, 1929, in the vicinity of Hannover, where the German State Railways had turned over a stretch of track for these trials. This track, about eight kilometers (five miles) long, lies between the towns of Burgwedel and Celle, in the Province of Hannover, and is ideally suited for such purposes as it is not in use at the present time. These tests were fairly successful but the experimental car was too light. It was decided, therefore to construct a car of commercial size; during the early months of this year such a coach, 26 meters (85⅓ feet) long and having an empty weight of approximately 20 tons, was constructed.

The first operating tests were made on August 15, 1930, and on September 23 high-speed trials were conducted with excellent success. A speed of 182 kilometers (113 miles) per hour was reached, and data collected indicated that much greater velocities could be attained over long distances. The starting acceleration of 0.63 meter (two feet) per second made it possible for the car to reach a speed of 100 kilometers (62 miles) per hour at the end of 66 seconds after covering a distance of 985 meters (3,231⅔ feet). The fuel consumption at a speed of 150 kilometers (93.2 miles) per hour amounted to 60 liters per 100 kilometers (0.25 gallon per mile).

Construction Details

Externally the new "Zeppelin on rails" resembles a rather low streamlined railway coach. The frame is slung between the axles in order to keep the center of gravity as low as possible. The pusher-type 4-bladed propeller is located at the extreme rear of the car and is driven by a 500 horsepower type VI airplane motor manufactured by the Bayerische Motorenwerke. The engine-cooling system is located in the space under the propeller shaft, so that it is completely inclosed. The motor also drives an air compressor for the brakes and two generators for charging the storage battery, which is located in the forward end of the car. In addition to supplying current for lighting and ventilation, this battery furnishes current for operating an electric motor for driving the coach when the airplane motor is not in use. This motor is used for starting and as an auxiliary source of power when running, and is connected to the front axle by bevel gears.

In addition to spring suspension, the coach is further protected against shocks by rubber cushions set between the running gear and the car body. The connection betwen the trucks and the car body is so flexible that smooth running is assured even at high speeds, and in spite of the exceptionally long wheel base of almost 20 meters (65½ feet), curves as small as 140 meters (459.3 feet) radius may be easily negotiated.

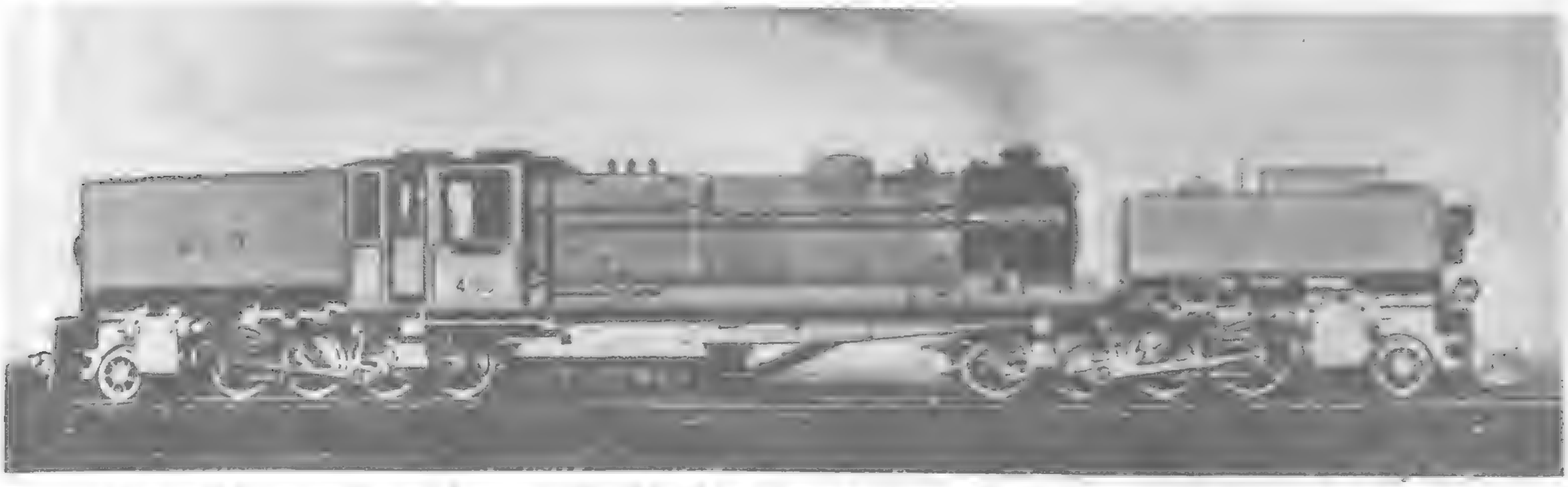
Two independent brake systems are provided.

The frame of the car is of extremely rigid construction, and consists principally of steel tubing. Other materials used in the construction of the car are aluminum, wood, insulating compositions, glass, rubber and fabrics.

Passenger Capacity

The space available for passengers and baggage is 16 meters long and is divided into a non-smokers' compartment with 12 chairs, an entrance vestibule, a smoking compartment with 12 chairs, and

(Continued on page 268).



2-8-0 + 0-8-2 Superheat Garratt Locomotive Built by Fried Krupp A. G. to the Specifications of the Indian State Railways

Krupp Locomotives for Asiatic Railways

Articulated Locomotives for India

THE above illustration represents a steam locomotive which differs essentially in its constructive features from the usual type. The boiler is carried on a frame or "cradle," which is entirely distinct from, and forms the connection between, two engine groups or driving bogies, to which it is joined by means of pivots. The front bogie carries the main water tank, while the coal bunker and an auxiliary water tank are supported on the rear bogie.

This type of locomotive, named after its inventor Garratt, is particularly suitable for use on narrow-gauge lines with difficult working conditions, where heavy trains have to be hauled at high speed up steep grades and through sharp curves. Garratt locomotives, owing to the flexibility obtained by the articulation of the frame, are perfectly steady when traversing the sharpest curves. On the other hand, a steadying gear is fitted for holding the boiler cradle and the two engine units in the central position when running on straight sections, so as to impart to the entire system the rigidity necessary for steady running.

The severe service conditions referred to cannot be met by a locomotive of the ordinary type. The Garratt-type locomotive, on the other hand, even when built for narrow-gauge track, allows of fitting the largest size of boiler which can be accommodated within the loading gauge, and of developing powers that even exceed those of the normal standard-gauge locomotives.

The Garratt type of locomotive has of late years been extensively adopted in various countries and has given entire satisfaction, particularly in the mountainous regions of the Union of South Africa, where the service is extremely arduous.

The Fried. Krupp A.G., of Essen (Germany), has supplied a considerable number of Garratt locomotives both to the South African Railways and to the Indian State Railways. A Garratt locomotive of exceptional power, one of a series supplied to the order of the Indian State Railways, is shown in our illustration.

Krupp Diesel Locomotive for the Japanese Government Railways.

In view of the rapid progress achieved by the stationary Diesel engine, the attention of Diesel engineers has of late been centering upon the practical application of this prime-mover as power unit of locomotives. This construction offers considerable advantages, inasmuch as the heat generated in a Diesel engine is much better utilized, and the fuel consumption per hph. developed is much less, than in the case of a steam locomotive. Moreover, as no water at all is consumed in operation, the Diesel locomotive enables railways to be run even in territories where water is not available. The Diesel locomotives can also be used to special advantage in districts where the cost of fuel oil is less than that of coal, and where the inconvenience of smoke and soot must be avoided.

Our illustration shows a Krupp Diesel locomotive, supplied to the Japanese Government Railway, for 1,067 mm (3 ft. 6 in.) gauge. It is equipped with a 600-hp engine and with mechanical power transmission from the engine to the driving wheels be means of a three-speed gear unit. The engine is to be used mainly for shunting service.

Krupp Diesel Locomotive supplied to the Japanese Government Railways: Gauge, 3-ft. 6-in.: 600 h.p. engine

The New M.B.K. Motor Ship "Taihei Maru"

New Japanese Motor Vessels

Built and Engined by the Shipbuilding Department of the M.B.K.. at it's Tama Yards

THE Tama Yard of the Shipbuilding Department of the Mitsui Bussan Kaisha, Ltd, has recently completed three new motor ships for its own services, the *Taihei Maru* and the *Shohei Maru*, and has another (the *Nagisan Maru*) 6,600 d/w ton vessel under construction. The July 1930, issue of *The Far Eastern Review*, fully described the shipping and shipbuilding activities of this great Japanese trading concern, which has taken the initiative in advancing the efficiency of Japan's mercantile marine. The M.B.K. operates its own fleet of 33 vessels with an aggregate of 178,222 tons, to which must now be added the three new ships above mentioned. It also operates under charter another 200,000 tons, a total of nearly 400,000 tons under one management. The fleet is used in general cargo trade, carrying the flag of the Rising Sun into all the out of the way ports of the world, seeking the cargoes of raw materials upon which the industrial life of the Empire depends. The M.B.K. Shipbuilding Department owns the right of manufacture and sales in Japan of the Burmeister and Wain Diesel engines and has successfully built and equipped several large vessels with these engines at the Tama Yards.

The two new motor vessels whose particulars are given below are also equipped with Mitsui-Burmeister and Wain Diesel engines, while the third, will be fitted with a most up-to-date Diesel engine of 6,000 h.p. with supercharger.

The general data of the two new vessels follows :—

Motor Ship "Taihei Maru"

Construction work started	..January 24, 1928
Launched	..July 9, 1928
Completed..	..September 3, 1928
Gross Tonnage	..6,285 tons
Deadweight Tonnage ..	..9,243 tons
Speed on trial trip... ..	..14½ knots
Speed for ordinary voyages	..12 knots

Particulars of Machinery

MARINE DIESEL ENGINE, (One set).

Mitsui-Burmeister & Wain's direct reversible, four cycle, single acting, cross-head, enclosed forced lubricated, blast injection system.

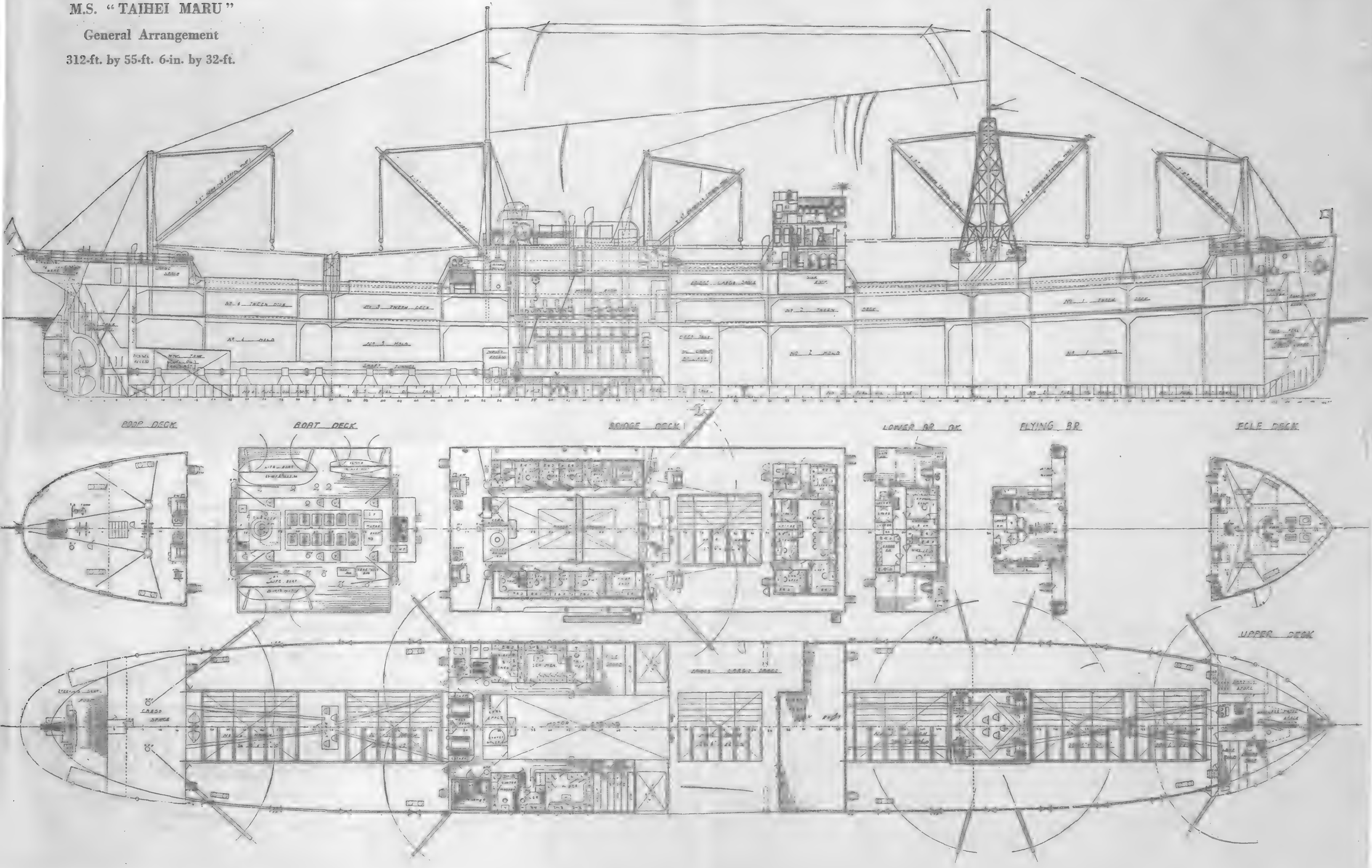
Type :	B. H. P. .. .. ..=2,180
Mitsui-B. & W. D. E. 8630-S	I. H. P. .. .. ..=2,850
No. of cylinder ..= 6	R. P. M. .. .. ..=120
Dia. of ,, ..=630-m/m.	Total engine weight including thrust
Length of stroke ..=1,500 ,,	shaft & bearing.. ..=275 tons

Launch of the M.B.K. Motorship "Shohei Maru" at the Tama Shipbuilding Yards

M.S. "TAIHEI MARU"

General Arrangement

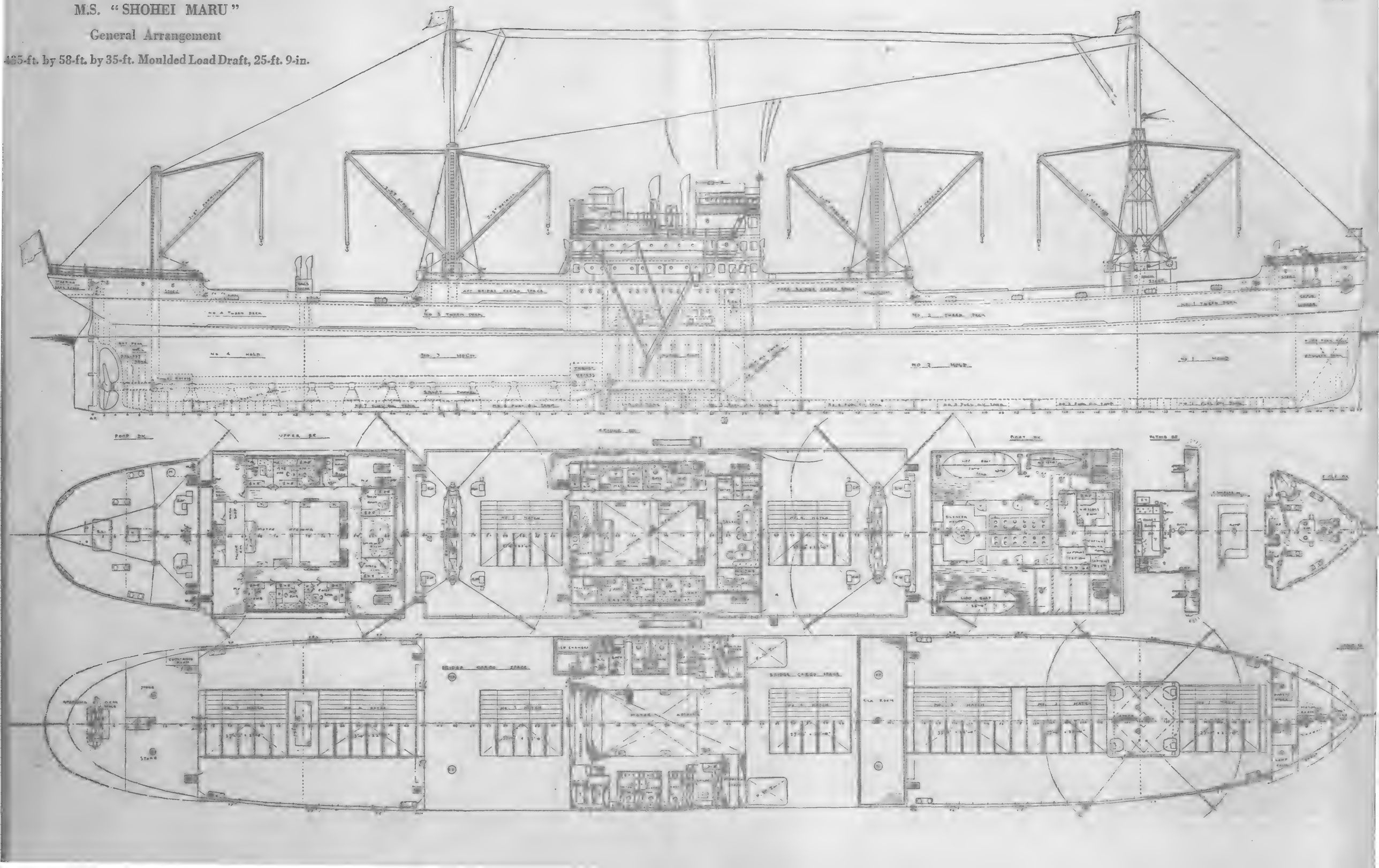
312-ft. by 55-ft. 6-in. by 32-ft.

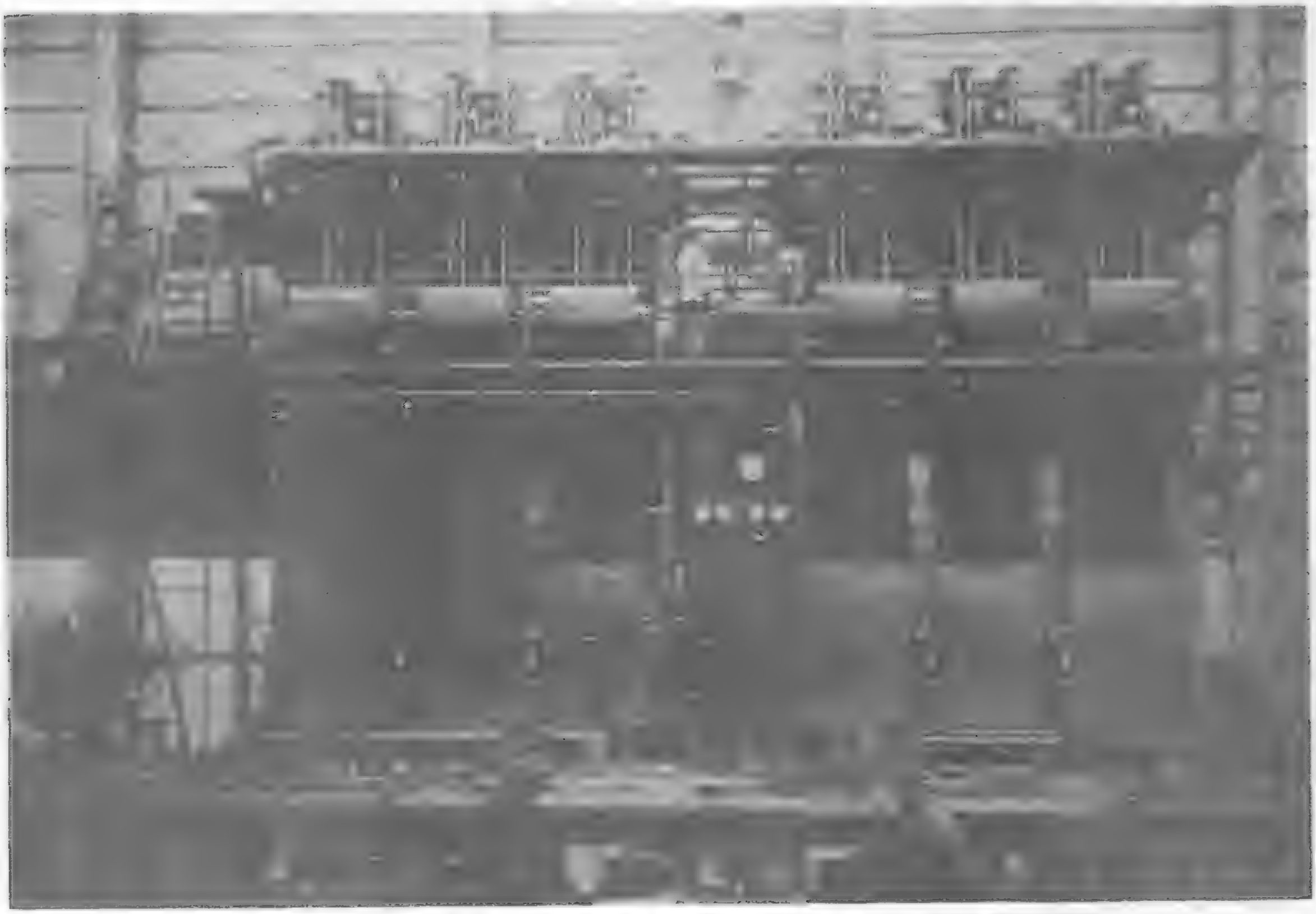


M.S. "SHOHEI MARU"

General Arrangement

435-ft. by 58-ft. by 35-ft. Moulded Load Draft, 25-ft. 9-in.





Mitsui-Burmeister & Wain, 2,180 b.h.p. Diesel Engine for the M.S. "Taihei Maru"

AUXILIARY DIESEL ENGINE, (Three sets).

Mitsui-Burmeister and Wain's non-reversible four cycle, single acting, trunk piston, enclosed forced lubricated, blast injection system.

Each to have direct connected manoeuvring air compressors and 66 kw. multipolar compound dynamo of D.C. 220 volts.

Type	250 U.M.
No. of sets	3
No. of cylinders	2
Dia. of ,, ...	310 m/m.
Length of stroke	350 ..
B. H. P.	100
R. P.M.	400

COMPRESSOR :

Stages	3
Max. air pressure	60 atm.
Capacity per hour	220 cub. m.

COMBINED FORCED LUBRICATING OIL AND COOLING WATER PUMP, (One set).

Driven by an electric motor.

Forced lubricating oil pump :
Capacity per hour .. .. .. 45 tons
Rotary gear type.

Cooling water pump :
Capacity per hour .. .. .. 120 tons
Centrifugal type.

COMBINED DAILY SUPPLY FUEL OIL AND STANDBY LUBRICATING OIL PUMP.

Driven by an electric motor.

Daily supply fuel oil pump :
Capacity per hour .. .. .. 10 tons
Rotary gear type.

Standby forced lubricating oil pump :
Capacity per hour .. .. .. 45 tons
Rotary gear type.

BILGE AND SANITARY PUMP, (One set).

Driven by an electric motor.
Capacity per hour .. .. .. 2 × 20 tons
Two throw plunger type.

BALLAST PUMP, (One set).

Driven by an electric motor.
Capacity per hour .. .. .. 150 tons

LUBRICATING OIL PURIFIER, (One set).

De Lavel type No. 600
Capacity per hour .. .. .. 250-300 gallons

FUEL OIL PURIFIER, (One set).

Sharples Size No. 6
Capacity per hour .. .. .. 200-350 gallons

DONKEY BOILER, (One set).

Vertical cross tube type with oil burners.

Mean dia. .. .. =	5-ft. 1-in.
Height .. .. =	11-ft. 5-in.
Heating surface .. .. .. =	115 sq. ft.
Working pressure .. .. .. =	100 lbs/sq. in.
Oil burner	One off.

PROPELLER, (One set)

Manganese bronze solid 4 blades.

Dia. .. .. =	14-ft. 3-in.
Pitch .. .. =	10-ft. 9-in.

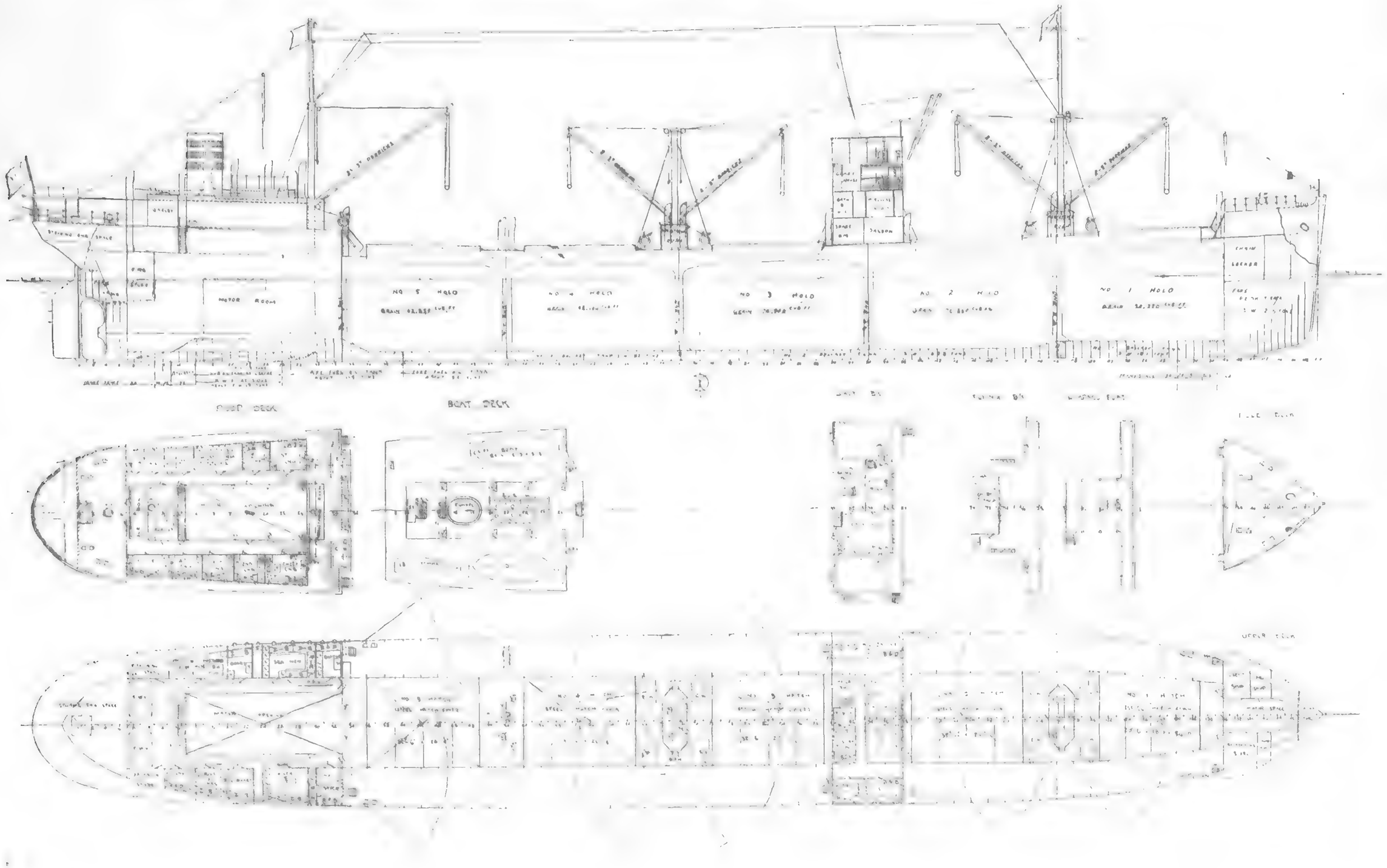
OTHER AUXILIARY MACHINERY AND TANKS :

One set hand driven emergency compressor.
One set hand driven emergency oil pump.
Two sets starting air reservoirs.
Three sets blast air bottles for main engine.
Three sets ,, ,, ,, ,, aux. ,,

GENERAL ARRANGEMENT OF M.S. "NAGISAN MARU"

360-ft. by 50-ft. by 29-ft.: Moulded Load Draft, 23-ft. 5-in.

Built and Engined at the Tama Shipbuilding Yard of the Mitsui Bussan Kaisha for the M.B.K. Fleet



Two sets daily supply fuel oil tanks.
One set hand driven oil transfer pump.
One set lubricating oil cooler.
One set lubricating oil purifier pump.
One set fuel oil purifier pump.
One set feed water pump.
One set fresh water pump.
One set turning gear for main engine.
One set 4 kw. motor generator for wireless, etc.

DECK MACHINERY :
Windlass : One off
Clarke Chapman's vertical type.
15 tons at 25-ft./min.
Steering Gear : One set
John Hastie's hele-shaw martineau electric hydraulic gear.
Cargo Winches : 12 sets
Shibaura's spur geared type.
2 sets of 5 tons capacity.
10 sets of 3 tons capacity.

Motor Ship "Shohei Maru"

Construction work started . .	March, 1930
Launched	January, 1931
Expected to be completed . .	by the end of March, 1931
Gross Tonnage	about 7,400 tons
Deadweight Tonnage . .	about 9,900 tons
Speed on trial trip	15½ knots
Speed for ordinary voyages . .	12½ knots.

Particulars of Machinery

MAIN DIESEL ENGINE, (One set)
Mitsui-Burmeister and Wain's direct reversible, four cycle, single acting, cross-head, enclosed forced lubricated, solid injection system.

Type : Mitsui-B. & W. D. E. 74—TF—150

No. of cylinders	= 6
Dia. of ,, ...	= 740 m/m.
Length of stroke	=1,500 ,,
B. H. P.	=3,300
I. H. P.	=3,900
R. P. M.	= 115
Fuel consumption per B.H.P. per hour	= 170 gm.
Total engine weight including thrust shaft and bearing . .	= 332 tons

AUXILIARY DIESEL ENGINE, (Three sets)
Mitsui-Burmeister and Wain's non-reversible four cycle, single acting, trunk piston, enclosed forced lubricated, solid injection system. Each to have direct connected manoeuvring air compressors and multipolar compound dynamos.

Type.	328—MTHK—45	228—MTHK—45
No. of sets	2	1
No. of cylinders	3	2
Dia. of ,, ...	280 m/m	280 m/m
Length of stroke	450 ,,	450 ,,
B. H. P.	165	110
R. P. M.	300	300

Fuel oil consumption per B.H.P. per hour =175 gm.

Dynamos :	328—MTHK—45	228—MTHK—45
Capacity	105 kw.	70 kw.
Voltage	D.C.220	D.C.220

Compressor :

Stages	2	2
Max. air pressure	25 kg/cm²	25 kg/cm²
Capacity per hour . .	180 cub.m.	180 cub.m.

COMBINED FORCED LUBRICATING OIL AND COOLING WATER PUMP, (Two sets).
Driven by an electric motor directly.
Forced lubricating oil pump :
Capacity per hour . . . . = 60 tons
Double herical gear type.
Cooling water pump :
Capacity per hour . . . . =175 tons
Centrifugal type.

DAILY FUEL PUMP, (One set)
Driven by an electric motor through gear.
Capacity per hour . . . . 30 tons
Gear type.

BILGE AND SANITARY PUMP, (One set)
Driven by an electric motor through worm gear.
One bilge and one sanitary pump.
Capacity per hour . . . . = 20 tons each.
Two throw plunger type.

BALLAST PUMP, (One set)
Driven by an electric motor.
Capacity per hour . . . . =150 tons
Drysdale's centrifugal pump.

FUEL OIL PURIFIERS, (Two sets)
Sharples Size No. 6
Capacity per hour . . . . =230-450 gal.

LUBRICATING OIL PURIFIER, (One set)
Sharples Size No. 6
Capacity per hour . . . . =230-450 gal.

SUPERCHARGING BLOWER, (One set)
Driven by an electric motor directly.
Capacity per hour . . . . =300 cub. m.
Pressure . . . . . =500 m/m water column.

DONKEY BOILER, (One set)
Vertical cross tube type with oil burners.
Mean dia. . . . . = 5-ft. 1-in.
Height . . . . . =11-ft. 5-in.
Heating surface . . . . =115 sq. ft.
Working pressure . . . . =100 lbs./sq. inch.
Oil burner . . . . Two off.

PROPELLER, (One set)
Manganese bronze solid 4 blades.
Dia. . . . . =15-ft. 3-in.
Pitch . . . . . =11-ft. 6-in.

OTHER AUXILIARY MACHINERY AND TANKS :
1 set fuel purifier pump.
1 set lubricating oil purifier pump.
1 set lubricating oil cooler.
1 set fresh water pump.
1 set turning gear for main engine.
1 set fuel oil standby wing pump.
1 set lubricating oil standby wing pump.
1 set feed pump for boiler.
1 set of workshop tools and machinery.
1 set 3 kw. motor for wireless.
2 sets starting air reservoirs.
2 sets daily supply fuel oil tanks.
1 set starting air reservoir for aux. Diesel, etc.

DECK MACHINERY :
Windlass, (One set)
Clarke Chapman's vertical type.
15¾ tons at 25-ft. per min.
Steering Gear, (One set)
John Hastie and Co.'s electric hydraulic steering gear type.
Cargo Winches, (14 sets)
Shibaura's double herical gear type.
Driven by an electric motor.
10 sets of 3 tons capacity.
2 sets of 5 ,, ,,
2 sets of 7 ,, ,,

M.S. "Nagisan Maru"

The third motor vessel referred to above, recently launched at the Tama Yards of the Mitsui Bussan Kaisha, is the *Nagisan Maru* of 9,200 tons D.W. for the M.B.K. fleet. This vessel is equipped with a 6,000 b.h.p. Mitsui-Burmeister and Wain Diesel engine built at the Tama Works ; to date, the largest marine type

Diesel engine built in Japan. The particulars of this vessel are as follows :

MAIN DIESEL ENGINE, (One set).

Mitsui-Burmeister and Wain's direct reversible, four cycle, single acting, cross-head, enclosed forced lubricated, solid injection system with Burmeister and Wain's rotary blower.

Type : Mitsui-B. & W. 1074—STF—150

No. of cylinder	... ...	10
Dia. of cylinder	... ...	740 m/m.
Length of stroke	... ...	1,500 ,,
B. H. P.	... ...	6,000 ,,
I. H. P.	... ...	7,300 ,,
R. P. M.	... ...	115 ,,
Fuel consumption per B. H. P. per hour...		175 gram.

AUXILIARY DIESEL ENGINE, (Three sets).

Mitsui-Burmeister and Wain's non-reversible, four cycle, single acting, trunk piston, enclosed forced lubricated, solid injection system. Each to have direct connected manoeuvring air compressors and 135 kw. multipolar compound dynamos.

Type : 428—MTHK—45

No. of cylinder	... ...	4
Dia. of cylinder	... ...	280 m/m.
Length of stroke	... ...	450 ,,
B. H. P.	... ...	210 ,,
R. P. M.	... ...	300 ,,
Fuel consumption per B. H. P. per hour...		175 gram.

DYNAMO.

Multipolar compound wound 135 kw

Voltage ... ... D.C. 220

Launching the "Nagisan Maru" at the Tama Yard

COMPRESSOR.

No. of stage	... ...	2
Max. compressed air press.		25 kg/cm²
Capacity per hour	...	240 cub. metre.

COOLING WATER PUMP, (Two sets).

Driven by an electric motor directly.

Capacity per hour	...	275 tons

Francis wheel type.

FORCED LUBRICATING OIL PUMP, (Two sets).

Driven by an electric motor directly.

Capacity per hour	...	125 tons

Wing type.

DAILY FUEL OIL PUMP, (One set).

Driven by an electric motor through spur gear.

Capacity per hour	...	30 tons

Double herical gear type.

R. P. M.	... ...	500

BILGE AND SANITARY PUMP, (One set).

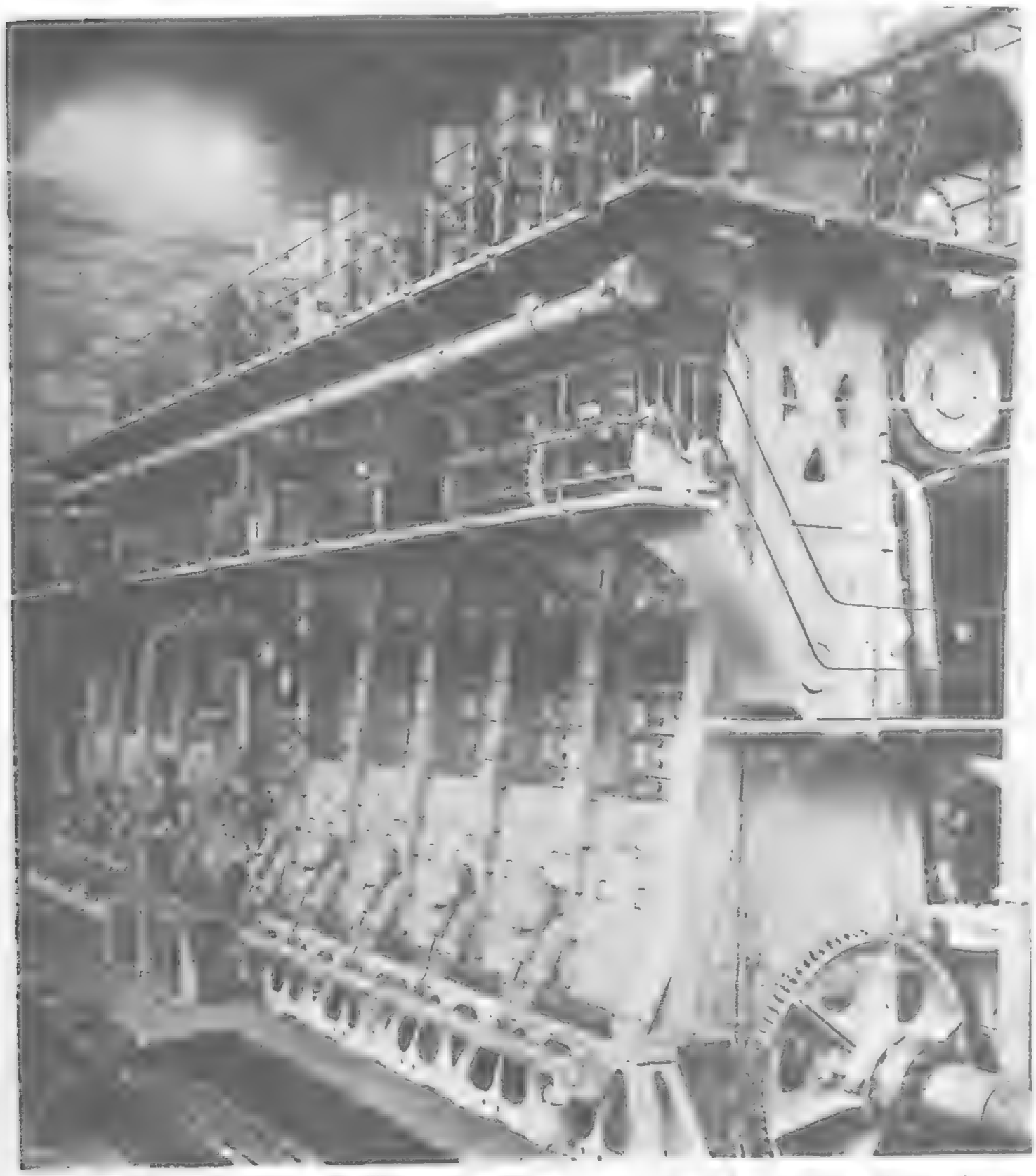
Driven by an electric motor through worm gear.

Two bilge and one sanitary pumps.

Capacity per hour	...	20 tons each.
R. P. M.	... ...	100

TURNING GEAR FOR MAIN ENGINE.

Worm gear to turning wheel driven by an electric motor.



Largest Marine Type Diesel Engine Built in Japan. 6,000 b.h.p. Mitsui-Burmeister Wain Diesel Engine Built at the Tama Yard for the "Nagisan Maru"

New M.B.K. Motor Vessel

The particulars of another motor vessel under construction at the Tama Yards for the M.B.K. fleet, not yet named but designated as Builder's Number 181, are given below :

MAIN DIESEL ENGINE, (One set).

Mitsui-Burmeister and Wain's direct reversible, four cycle, single acting, trunk piston, enclosed forced lubricated, solid injection system.

Type : Mitsui-B. & W. 855 - MTF -100

No. of cylinder	... ...	8
Dia. of cylinder	... ...	550 m/m.

Length of stroke ... ... 1,000 m/m.
B. H. P. ... ... 1,850 ,,
I. H. P. ... ... 2,200 ,,
R. P. M. ... ... 140 ,,
Fuel consumption per B. H. P. per hour... 165 gram.

AUXILIARY DIESEL ENGINE, (Two sets).

Mitsui-Burmeister and Wain's non-reversible, four cycle, single acting, trunk piston, enclosed forced lubricated, solid injection system. Each to have direct connected manoeuvring air compressor and 70 kw. multipolar compound dynamos.

Type : Mitsui-B. & W. 231 MTHK 35

No. of cylinder 2
Dia. of cylinder ... ... 310 m/m.
Length of stroke ... ... 350 ,,
B. H. P. ... ... 105 ,,
R. P. M. ... ... 4,000 ,,
Fuel consumption per B. H. P. per hour... 195 gram.

DYNAMO.

Multipolar compound wound 70 kw.
Voltage ... ... D.C. 220

COMPRESSOR.

Max. compressed air pressure ... ... 25 kg/cm²
Capacity per hour ... ... 240 cub. meter.

COMBINED FORCED LUBRICATING OIL AND COOLING WATER PUMP, (Two sets).

Driven by an electric motor directly.
Forced lubricating oil pump :
Double herical gear type.
Capacity per hour ... ... 40 tons
Cooling water pump :
Centrifugal type.
Capacity per hour ... ... 100 tons

DAILY FUEL OIL PUMP, (One set).

Driven by an electric motor directly.
Gear type.
Capacity per hour ... ... 15 tons

BILGE AND SANITARY PUMP, (One set).

Driven by an electric motor through worm gear.
One bilge and one sanitary pump.
Capacity per hour ... ... 20 tons each.
R. P. M. 100

BALLAST PUMP, (One set).

Driven by an electric motor directly.
Centrifugal type.
Capacity per hour ... ... 150 tons

FUEL OIL PURIFIER, (One off).

Driven by an electric motor through bolt.
Type : Sharples Presutite No. 6
Capacity per hour ... ...230—450 gallons.

LUB. OIL PURIFIER, (One off).

Driven by an electric motor through bolt.
Type : Sharples Standard No. 55
Capacity per hour ... ...200—350 gallons.

PUMP FOR FUEL OIL PURIFIER, (One set).

Driven by an electric motor through spur gear
Spur gear type.
Capacity per hour ... ... 4.5 tons
R. P. M. 900

PUMP FOR LUB. OIL PURIFIER, (One set).

Driven by an electric motor through spur gear.
Spur gear type.
Capacity per hour ... ... 2.5 tons
R. P. M. 900

LUBRICATING OIL COOLIER, (One off).

Circular type single flow.
Cooling surface ... ... 46.8 m²

TURNING GEAR FOR MAIN ENGINE, (One off).

Worm gear to turning wheel driven by an electric motor.

Diesel Engine Output of the M.B.K.

Up to March 1, 1931, the Tama Yards of the M.B.K. has built 35 Diesel engines of the Mitsui-Burmeister and Wain Type with a total of 29,779 b.h.p. The particulars of the various vessels built and equipped at the Tama Yards follow :

Name of Vessel	Owner	D.W.	Main Engine: No. of cyl.	Type	No.	When launched	Trial speed	Aux. Engine: No. of cyl.	b.h.p.	r.p.m.	Wt.	No.	Type	Remarks
Takanisan Maru	M. B. K.	3,145	6	6125—M	1	1928-Feb.	11.4	3	1,250	160	87	1	Built by B. & W.	with L.P. supercharger.
Takusansan Maru	,,	3,141	6	8250—P	1	1929-Mar.	11.6	2	950	135	87	1	,,	with H.P. supercharger.
Hakonesan Maru	,,	9,671	8	855—MT—100	2	1929-Mar.	15.4	4	5,300	135	310	1	131—MTHK—35	
Konsan Maru	Dairen K.	4,156	6	655—MT—100	1	,, July	12.6	2	1,400	140	150	1	Built by B. & W.	
Fonsan Maru	,,	4,156	6	655—MT—100	1	1929-Aug.	12.6	2	1,400	140	115	1	131—MTHK—35	
For Our Shop	,,							4	1,400	140	115	3	131—MTHK—35	
	Total	24,272			6				11,620		914	3		

UNDER CONSTRUCTION :														
Yard No. 180	Shimatani K.	9,900	6	740	1,500	3,900	3,300	115	3	320	900	1	328—MTHK—45	with L.P. supercharger.
,, 181	M. B. K.	6,000	8	550	1,000	2,200	1,850	140	2	165	1,100	1	228—MTHK—15	with H.P. supercharger.
,, 182	,,	5,300	5	630	1,000	2,100	2,000	,,	2	210	1,000	2	231—MTHK—35	
,, 183	,,	1,500	6	550	1,000	1,660	1,400	,,	3	315	1,000	3	,,	with H.P. supercharger.
,, 184	Dairen K.K.	9,500	,,	,,	1,000	1,660	1,400	,,	3	180	1,000	3	,,	
,, 185	K. K. K.		,,	,,	1,000	7,300	6,000	115	4	600	1,000	3	331—MTHK—35	with H.P. supercharger.
Uraga No. 371			10	710	1,300						1,300	3	428—MTHK—45	with H.P. supercharger.
	Total	16,500				21,320	17,800			2,720				
	Grand Total	70,772				32,940	26,900			2,879				

A Western Pacific silk train on its eastward dash to the Atlantic seaboard via the Feather River route. This is a twelve-car train

Rushing Silk Across the Continent*

THE magnitude of the raw silk movement across the country (America) is indicated by the fact that in 1929 over 500,000 bales, or more than $325,000,000 worth of silk unloaded at four west coast ports was transported by railroads to eastern points for manufacturing. Furthermore, the railroads which participated in the transportation of the silk received over $6,000,000 in revenue. Because of the great value of the shipments, dispatch is a factor, and a cargo is usually unloaded from the boat, placed on trains and started across the continent within three to four hours after the boat docks. In 1929 nine steamship companies carried the silk from China, Japan and India to the west coast ports, while over 20 railroads participated in the movement from the west to the east.

The west coast ports at which silk-carrying ships dock are Vancouver, B.C., Seattle, Washington, Portland, Oregon, and San Francisco, California, and the number of bales received in 1929 was 133,796 at Vancouver, 231,548 at Seattle, 10,438 at Portland, and 144,213 at San Francisco. The point of destination is usually New York, Hoboken, and the territory thereabouts, although there is usually some for Chicago, Indianapolis, Indiana, and beyond. Although the methods of handling shipments of silk are quite similar at all ports, some of the practices and customs that have been established coincident with the development of the transportation of silk at Seattle make this port an interesting example.

When a cargo of silk leaves a foreign port, the destination port is notified and kept informed of the progress of the vessel so that all agencies that are to take part in the rail movement can prepare. Competition among the railroads soliciting this business is keen because of the revenue derived from the handling of this commodity and because of the spirit of contest which this expedited service has developed among the employees on each railroad, yet certain traffic alliances that were established years ago determine the routing of the shipments over the railroads. If the cargo arrives at Seattle on one of the ships of the Osaka Shosen Kaisha, the Chicago, Milwaukee, St. Paul and Pacific will carry the merchandise east. This is a result of arrangements that were established in the early days of silk transportation. Likewise, the business of the Nippon Yusen Kaisha is always given to the Great Northern as a result of the activities of James Hill in placing these companies on friendly terms 34 years ago. The business of the American Mail Line, the Kawasaki, Kisen Kabushiki Kaisha, the Mitsubishi Shoji Kaisha, and the Mitsui Bussan Kaisha, which totaled 95,892 bales in 1929, is distributed among all lines operating from Seattle—the Union Pacific, the Northern Pacific, the Great Northern and the Chicago, Milwaukee, St. Paul and Pacific. The intermediate and destination carriers have no agreements with the ocean lines, and any business that they receive is a result of solicitation and past performance.

When a steamer leaves Yokohama the steamship company cables its representative in Seattle, advising the number of bales and tons of silk in the cargo. When the steamer gets within radio distance the captain of the ship sends a radiogram to the port captain of the steamship company advising him of the approximate time the steamer will reach William's Head, which is the Canadian entrance to Puget Sound, and about 30 miles off Victoria, where all steamers are held for medical inspection. In this radio is also conveyed the information as to how the silk is stowed in the ship—whether in one, two, three or four hatches. From this information preparations are made for the handling of the silk on its arrival at the Seattle dock.

When the steamer docks at Victoria, B.C., a representative of the railroad, known as the Customs agent, boards

Stevedores are loading a Santa Fe silk car after the steamer's arrival at San Francisco

*Reprinted from the *Railway Age*.

This twenty-two car silk special is the largest to leave San Francisco for the East. This photograph was taken on the start of the rail journey via the Southern Pacific, and Union Pacific Lines to Omaha and Chicago

the steamer, and while she is in transit to Seattle he prepares the necessary papers for the filing of the Customs entries. On raw silk, there being no duty, it is a part of the tariff provision that the railway company must make the consumption entry; and in order to expedite the handling, the railroad arranges for a Customs officer to be at the dock when the ship arrives after Custom-house hours. When she arrives during Custom-house hours, the Customs agent must go to the Custom-house and file his entry. On silk goods an "Immediate Transportation" entry must be filed for the reason that goods traveling on such an entry must be billed in bond. The railway company is required to furnish a bond, about two million dollars, for the safe handling of immediate transportation entry goods, and also for the surrender to the Customs of the original bills of lading on raw silk.

Prior to the arrival of the steamer in the port, and on receipt of the advice as to the number of bales of silk in cargo, it is necessary for the railroad to assemble passenger equipment, such as baggage cars or express refrigerators, to take care of the loading. Before these cars are placed for loading they are carefully inspected by the mechanical department. The wheels are all jacked up, the brasses inspected, and, if necessary, new brasses applied, then properly lubricated. The cars must be cleaned and the steam pipes going through them must be disconnected; the lamps, if any, have to be removed, and the stoves and other projecting appliances of the cars must be crated so as to avoid any damage to the silk by shifting. All the doors must be examined to see that they are tight, and after the cars are loaded these doors are battened with paper so that there can be no possibility of damage by water. If the shipment is large a special train is prepared, while if it is small the cars are carried on regular passenger trains.

As soon as a boat arrives at Seattle the silk is unloaded on to the dock and placed in sheds, where it is inspected by Government Customs men. The railroad then checks the bale numbers, loads the cars according to destination, and records the location of each bale according to the car in which it is placed. The unloading of the boat and the loading of the cars, each of which is accomplished in one and one-half hours, proceed under the scrutiny of railroad special agents. This protection is necessary, since each bale is valued at approximately $650.

The operating department of the railroad handling the shipment out of Seattle is notified before the boat arrives that it will be called upon to operate the special train, and word is passed along the line so that all divisions will be ready. Each operating division is given a schedule as soon as possible after the boat docks. These schedules are based on the maximum time in which the silk must move over the railroad and, as a result each division endeavors to handle the train over its territory in less than the allotted time and to make a better performance than other divisions. The first division informs the next of the progress of the train, so that no time will be lost when the cars are turned over to the succeeding division. Both the operating and traffic departments at Seattle are also informed of the progress of the train.

The routing of this traffic involves several railroads, the greater portion being handled through Chicago. The lines which receive the cars from the originating lines are informed when the boat arrives that they will handle the shipment. They also prepare for the handling of the cars in advance. On railroads where traffic is dense it is necessary to give silk trains preference.

The running time between the west coast ports and New York is often better than that of passenger trains. In 1927 the average time for all shipments, both special trains and single cars, was 87 hours, and in 1928 it was 82 hours, while in 1929 it was 81 hours. The frequent speed of some of these trains is indicated by two performances. In one of these, ten cars left Seattle on August 13, 1924, at 1.05 p.m., and arrived in New York at 7.20 p.m. on August 16, or in 75 hours and 15 minutes, including terminal delays. On August 14, 1924, nine cars were sent from Seattle to New York, where they arrived in 73 hours and 25 minutes. The time from San Francisco to New York is practically the same as that from Seattle, while the average rail time from Vancouver is approximately90 hours.

The size of the shipments varies and seldom requires the same number of cars. A special train usually contains ten cars, although some shipments require 14 cars in a train. In December, 1923, a shipment received at Seattle required 30 cars, which were handled in two special trains.

At Vancouver four steamship companies,—the Canadian Pacific Steamships, Ltd., the Osaka Shosen Kaisha, the Mitsui Bussan Kaisha, and the Blue Funnel Lines—deliver the silk, while two railroads—the Canadian National and the Canadian Pacific—carry it to the east. At San Francisco five steamship companies—the Dollar Steamship Company, the Nippon Yusen Kaisha, the Kawasaki, the Kisen Kabushiki Kaisha and the Mitsui Bussan Kaisha—transport the silk from the Orient, and three railroads—the Southern Pacific, the Atchison, Topeka & Santa Fé and the Western Pacific—start it on its rail journey.

The methods employed at San Francisco are similar to those at Seattle, except that on the Southern Pacific specially designed cars are used. Special agents at the points at which the train stops are notified in advance and protect the train on its arrival.

Prior to 1926 silk was handled almost entirely by rail, but since then the Panama Canal has diverted much of the traffic to the water route.

Number of bales received at West Coast Ports since 1923, according to the Silk Association of Ameria, Inc. :

	Seattle	*Vancouver*	*San Francisco*	*Portland*	*Suez*	*Panama*
1923 ..	186,450	93,687	55,645	—	—	—
1924 ..	243,013	88,411	49,043	—	—	—
1925 ..	277,624	108,698	103,312	—	—	—
1926 ..	256,440	119,070	107,240	—	17,512	1,105
1927 ..	241,131	154,140	117,900	—	19,959	16,640
1928 ..	245,278	143,845	132,634	—	8,695	31,319
1929 ..	231,998	133,796	144,216	10,438	12,224	116,496

In 1926 only 1,105 bales passed through the Panama Canal, while in 1929 the number had increased to 116,496 bales. A comparison of the charges on similar shipments over both routes shows a great difference in the costs. On a shipment of 126,000 pounds transported by rail the shipper pays an ocean rate of $3 per hundred from the point of origin to the west coast port and a $9 rail rate, or a total of $15,120. The interest on the $585,000 invested for the 13 days required in transportation is $1,250 and the insurance $643, or a grand total of $17,013. In contrast the all-water rate of $6 makes a total transportation charge of $7,560, which, with interest of $1,924 for 20 days, and insurance of $2,164, makes a grand total of $11,648. The difference between the cost of the water-rail service and the all-water service, which in this case is $5,365, appeals to the shipper. Attempts have been made to secure a $6 rail rate, but until the present time all of the carriers have not agreed to the reduction.

The Great Northern Silk Express

American transportation circles are watching with keen interest the growth and needs of commerce with the Far East and among those who are particularly watchful are the officials of the Great Northern Railway.

A great circle drawn between the Atlantic seaboard of America and the major cities of the Orient passes almost directly through Puget Sound and very closely parallels the existing steamer lanes and the tracks of the Great Northern between Seattle and Chicago. The Puget Sound ports are the closest ports to the Orient and the Great Northern is the shortest and easiest rail line from Puget Sound to Chicago.

Modern loading and unloading facilities have been provided at the docks at Seattle and other Puget Sound ports permitting quick transfer from water to rail and *vice-versa*. Silk shipments, for example, are started east by rail within a few hours after the steamer docks in Seattle. Often the silk arrives in the eastern American cities a day or more before the fast express passenger trains.

The Great Northern Railway holds all records for the speedy movement of silk. Trainloads of silk have been transported from Seattle to New York in less than 75 hours elapsed time as compared with approximately 80 hours, the fastest possible time by passenger train.

The Great Northern not only has the shortest route but the easiest route across northern United States. It passes under the Cascade Mountains through an 8-mile electrified tunnel at an elevation of less than 3,000 feet. The American Rockies are crossed through Marias Pass with an extremely low summit of only 5,213 feet—only 55 miles of the Great Northern line is above 4,000 feet. The drainage of the Missouri-Mississippi valleys are then followed all the way to Chicago.

The ease of the Great Northern route is indicated by the fact that 100-car freight trains can be handled all the way through. Special locomotives have been built for both freight and passenger service, each especially designed for the character of country in which they are to be used. Millions of dollars have been spent in laying heavy rails and reducing curvature. The ease with which the run is made is indicated by the fact that the Great Northern's crack passenger train, The Empire Builder, which sets the pace between the Pacific Northwest and Chicago, has virtually a 100 per cent record for on-time arrival at terminals.

The Great Northern, under the leadership of the late James J. Hill, "the empire builder," led American railroads in interest in Oriental trade. It was at Hill's invitation that the first Japanese commercial vessel, the *Miiki Maru*, dropped anchor in Puget Sound in 1896.

The Great Northern serves all the Pacific Northwest ports—Seattle, Tacoma, Everett, Bellingham, Portland and Vancouver, B. C.

Great Northern Express Silk Train

With traffic representatives in all important American centers who specialize in the export and import traffic it also serves as an important artery between eastern and central America and the Orient. It has special representatives who carefully watch the transfer of all import shipments from the various steamers to see that they are properly loaded and braced when loaded into the freight cars.

In 1932, through construction of a new line in connection with the Western Pacific Railroad, the Great Northern will extend its service into San Francisco, thus providing still further contact between America's Oriental ports and the Atlantic seaboard.

Indicative of the Great Northern's interest in Far Eastern trade is the fact that one of its crack trains (one of the best known in America) is called the Oriental Limited.

Port of Seattle

SEATTLE is several hundred miles nearer the Orient than any other major port in the United States.

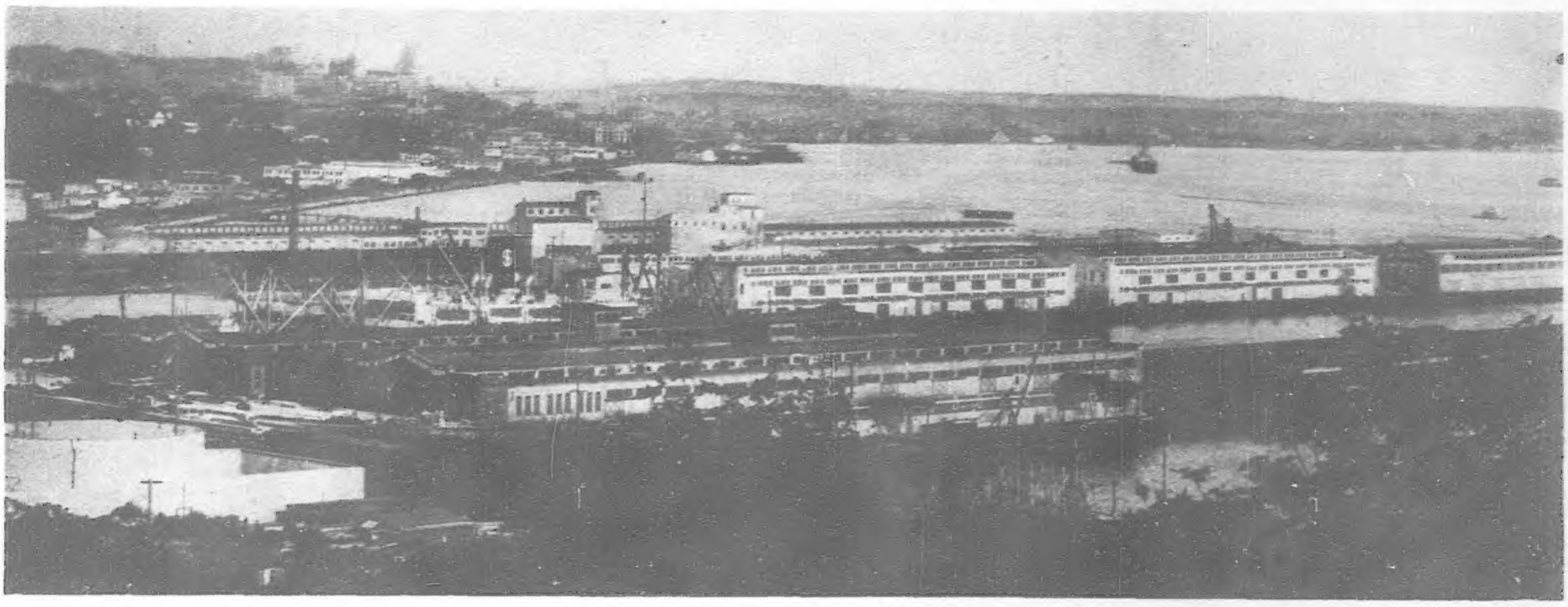
There are now 144 regular steamship lines connecting Seattle with ports in all parts of the world. Six trans-continental railway systems connect Seattle with the centers of population in the United States and Canada.

The commerce of Seattle includes a wide range of products. Alaska contributes several million cases of tinned salmon every year, as well as copper ore, lime stone and salt fish in large quantities. From the Orient come vegetable oils, wool, bean cake, nuts, carpets and rugs, matting, porcelain, tea and raw silk. California contributes tinned fruit, oranges, lemons and petroleum products. Ships from the Atlantic Coast of the United States and from Europe *via* the Panama Canal bring paper, cast iron pipe and steel in various forms. Ships to the Orient take lumber, wheat, flour, fish, paper and fruit from the local tributary territory and manufactured goods from a territory reaching back to the Atlantic Coast.

The following table gives the total foreign and domestic commerce in tons and valuation handled through Seattle :—

Year	*Tons*	*Value*
1904	1,159,234	$ 75,696,554
1909	1,712,998	122,439,112
1914	2,144,933	154,599,947
1919	5,496,666	750,071,907
1924	7,611,592	664,567,049
1929	9,167,295	771,174,069

On account of the natural depth in the approaches to Elliott Bay and in the bay itself no dredging has been required to make a harbor for Seattle. All that was necessary was to build piers and wharves for the ships to lie alongside while loading and discharging cargo. The earlier waterfront terminals were built and owned largely by the Railroads, and were leased to steamship companies or to operating dock companies.



Piers 40 and 41. Smith Cove Terminal of the Port of Seattle

By 1910, with the approaching completion of the Panama Canal, the sentiment in Seattle became general that if the port were to get its share of shipping it would be necessary to provide additional and modern terminals, constructed without delay, and, for the proper encouragement of shipping, to have these terminals publicly owned and operated. Authority was therefore obtained from the State of Washington and the Port of Seattle was organized.

This is a municipal corporation that includes Seattle and the surrounding territory contained in King County. The Port District has the power to acquire land and build facilities to promote commerce and shipping.

The Port of Seattle has expended over $12,000,000 in acquiring land and building modern terminals, designed to facilitate the handling of the various kinds of cargo peculiar to the port. In all, seven terminals have been provided, each adapted to serve certain specific kinds of cargo and shipping.

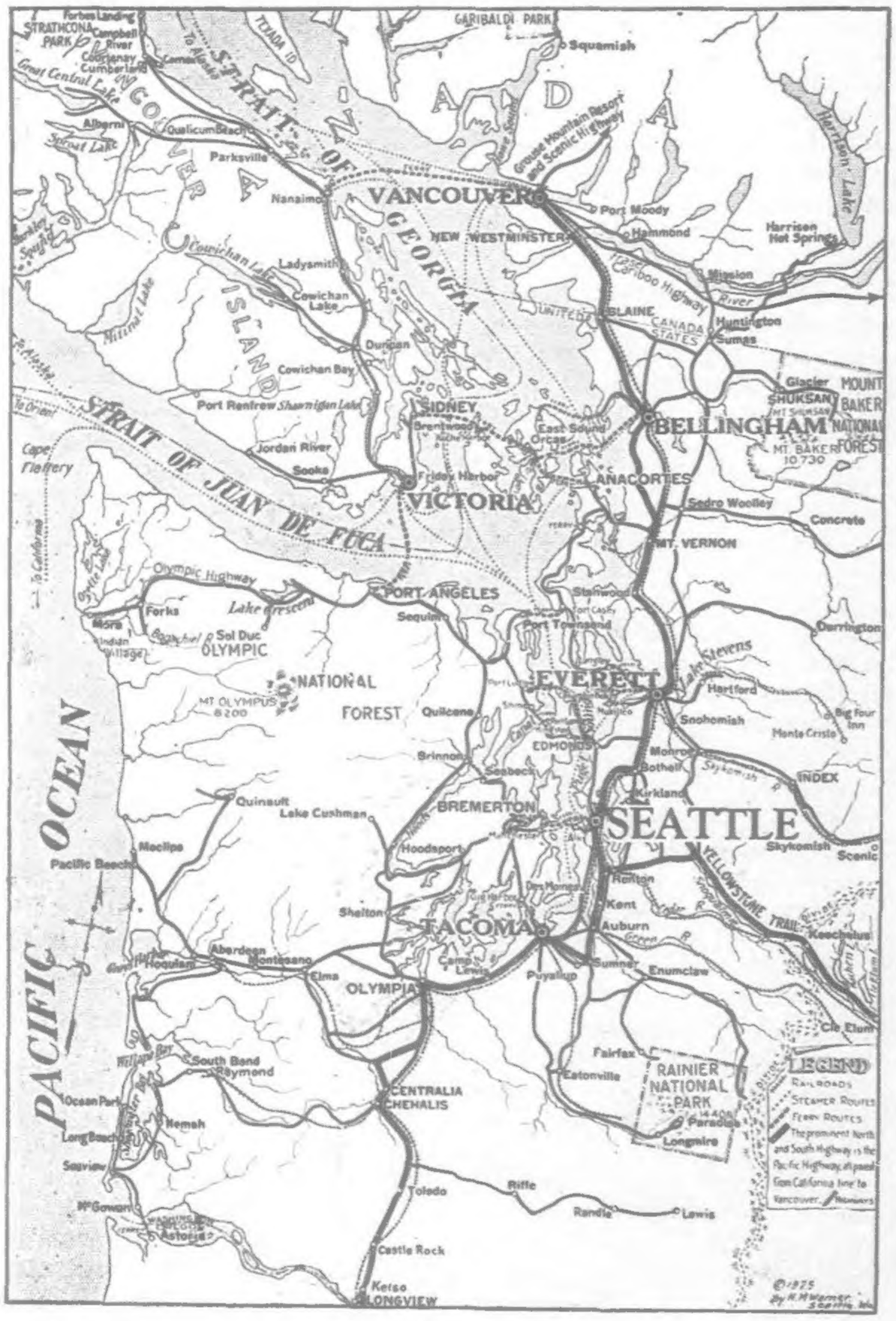
The Salmon Bay Terminal, located on the south side of Salmon Bay, above the locks of the Lake Washington Ship Canal, offers opportunity for the mooring and repair of boats of the fishing fleet that operate out of Seattle This terminal includes moorings, two marine ways for hauling out boats for painting and repair, and complete machine shops.

The Smith's Cove Terminal consists of two piers, Nos. 40 and 41, each about one-half mile in length. Pier 40 is 310 feet in width and Pier 41, 367 feet. At the shore end of Pier 41 there are two 2-story transit sheds with depressed railroad tracks between and with open wharf aprons, with two railroad tracks, on the water side. The American Mail Line ships dock at this pier, using the upper story for cargo. The upper floors of the two sheds are connected by bridges to a reinforced concrete viaduct along Garfield Street so that the upper and lower floors are reached by motor truck and automobile equally well. The outer 2,000 feet of this pier is open wharf, well served by railroad tracks, and is used for the handling of heavy cargo that does not require covered storage space.

Oil pipe lines are installed to carry vegetable oil, pumped from the ships, to steel storage tanks standing on filled ground north of the pier or into tank cars standing on the depressed tracks between the sheds. Pipe lines for fuel oil and gasoline are also laid on the pier to convey these oils from tankers lying alongside to steel tanks constructed on land leased by the Port to Oil Companies.

Pier 40 has a U shaped 1-story transit shed at the outer end of the pier that provides three berths for ships. North of this transit shed there have recently been constructed four 2-story transit sheds, two on each side of the pier. The new sheds were built primarily for the handling and storage of tinned salmon. Down the center of the pier between the new sheds is a concrete roadway and four depressed railroad tracks. On each side of the pier is an open wharf apron with two railroad tracks.

The Bell Street Terminal, located at the foot of Bell Street in the central district of the waterfront, is near the market and retail districts. It consists of a wharf carrying a 2-story transit shed that runs out at an angle of about 45 degrees with Railroad Avenue for a distance sufficient to give one ship's berth and then extends parallel to the shore for about 800 feet. Behind the wharf, beyond



Map Showing Relationship of Seattle and Puget Sound to the Pacific Ocean

the depressed tracks is a 4-story reinforced concrete warehouse and office building. Most of the warehouse space has been equipped for the cold storage of perishable products and is now used largely for the storage of salt herring and mild cured salmon, although nuts, potatoes, celery and other food products are also stored in this warehouse.

The natural topography is such that a bridge over Railroad Avenue connects the warehouse at the third floor level with the streets leading uptown. A ramp leads from the west end of the bridge down to the second floor of the transit shed at the south end and another ramp leads down to the north to connect with the second floor of the transit shed at that end and then turns south and runs down to the level of the wharf and Railroad Avenue.

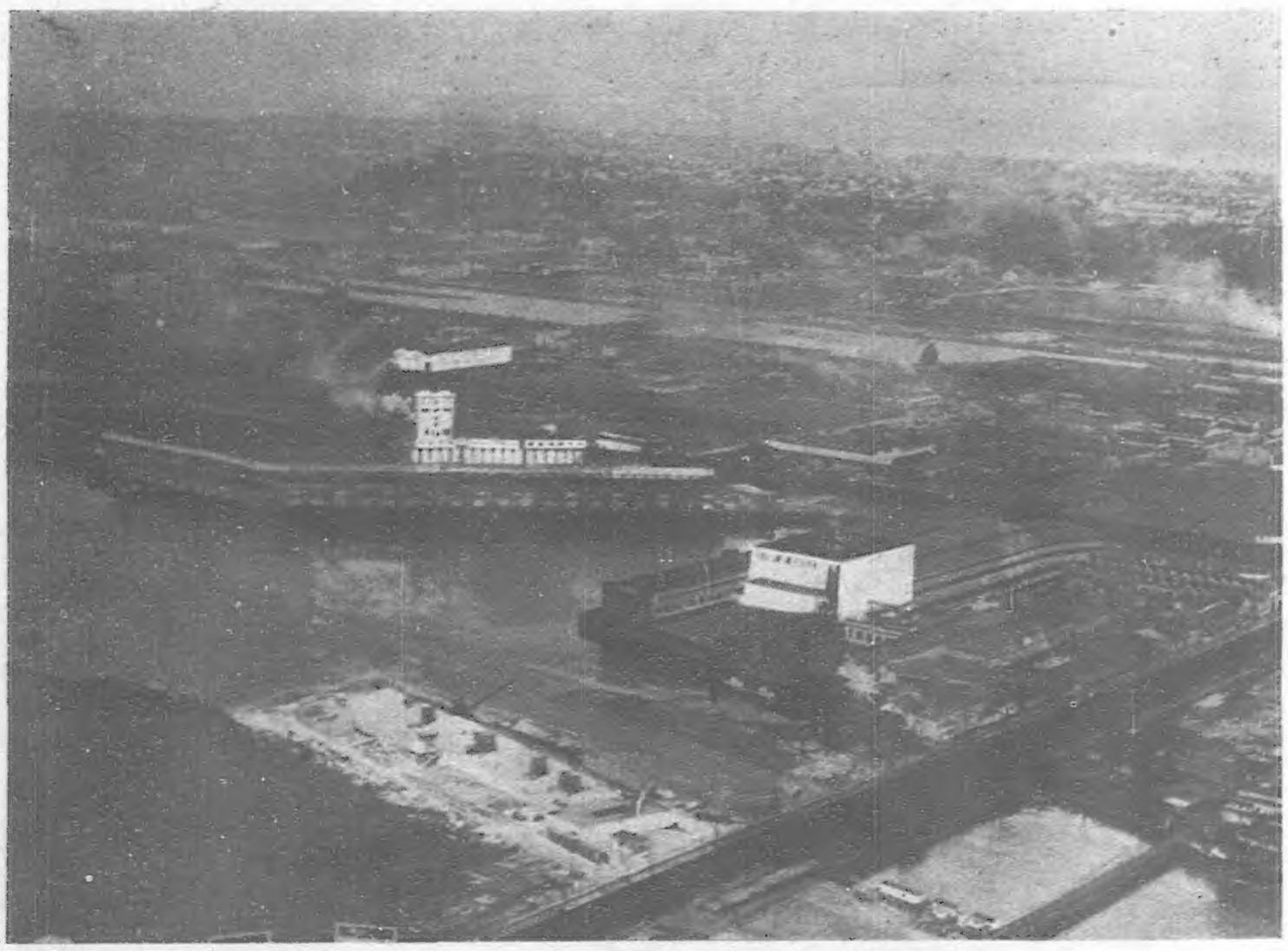
Airplane view of central section of waterfront looking north, showing business district with Lake Union in background. *(Copyrighted by Pierson Photo Co.)*

Just south of the Bell Street terminal lies the Lenora Street Pier which has recently been acquired and rebuilt by the Port of Seattle. The south half of the pier was reconstructed to provide a modern terminal for the ships of the Canadian Pacific Railway that ply daily between Seattle, Victoria and Vancouver. Two berths were provided, one on the south side of the pier and the other at the west end. Each berth is equipped with a Barlow Marine elevator for transferring automobiles between ship and wharf through the side ports of the ships. For each berth there is also an adjustable passenger landing and ramp that leads from the ship to the customs examination room on the second floor of the transit shed. From the customs examination room the passengers pass to the large, well lighted waiting room that is provided with every reasonable convenience for the travelling public. Outside the waiting room on the north side is an open plaza where motor cars coming down the concrete viaduct along Lenora Street from uptown can turn, discharge or pick up passengers and then return up the viaduct. Luggage and freight are taken care of on the lower or main floor of the transit shed.

The north half of the pier is provided with a 1-story transit shed for handling general cargo of the ships using the berth on the north side of the pier.

The Stacy Street Terminal includes a slip or waterway 212 feet wide and about 800 feet long. On either side of the slip is a wharf and transit shed. A waterside railroad track is provided on the open apron in front of each shed and two depressed tracks at the back. At the shore end of the slip is a 4-story reinforced concrete warehouse. Two floors of this warehouse are equipped with thermostatically controlled heating units that prevent the temperature from falling below a predetermined point. This provides proper storage conditions for tinned fruit. This terminal has been used largely for the handling and storage of tinned salmon and tinned fruits, but general cargo is also handled through the transit sheds.

The Hanford Street Terminal is planned primarily for the receipt, storage and shipment of grain, both in bags and in bulk. Provision is also made for handling general cargo through the transit shed. The terminal includes a wharf that affords berthing space for three ships, a 2-story transit shed, a reinforced concrete grain elevator with a storage capacity of 1,500,000 bu. of grain, a sacked grain storage building and several smaller buildings



Airplane view of Hanford Street Terminal at the left with the Grain Elevator and Spokane Street terminal at the right, with the cold storage plant and warehouses. *(Copyrighted by Pierson Photo Co.)*

Ample railroad trackage is provided to care for the cargo that passes through the transit shed, as well as the grain for the elevator. Grain is received by rail, passed through the working house of the elevator where it is cleaned, scoured, washed, or treated in any way that its condition requires, and is held in the storage bins until shipped. Most of the grain goes out by ship and is transferred from the elevator to the ship by conveyor belts and spouts that lead it down into the hold of the ship. Loading of two ships can be done at the same time. Sacked grain is stored in a section of the transit shed and in a separate building provided for that purpose.

At the Spokane Street Terminal, in addition to the wharf that affords berthing space for three ships, there is a 2-story transit shed, a 2-story tinned salmon warehouse, a 7-story concrete cold storage warehouse, an ice making plant and a fish freezing and cold storage plant.

The wharf and transit shed are used for general cargo but considerable space, particularly on the second floor, is ordinarily devoted to tinned salmon storage.

The large cold storage building has space for 15,000 tons of goods, or a net capacity of over 1,800,000 cu. ft. The space is

divided into rooms, there being six storage rooms to a floor except on the ground floor where there are a greater number of smaller rooms. Refrigeration is supplied by a direct expansion ammonia system, the pipes being in the storage rooms. The rooms are insulated and piped for different temperatures down to 12 degrees below zero Fahrenheit. This plant has been successful in the storage of dairy products, fresh eggs, berries, reindeer meat, nuts and other perishable products.

The fish freezing and cold storage plant is located to the west of the large cold storage building, with an ice storage house with a capacity of 5,000 tons of ice between. The fish plant includes cranes for handling fresh fish from the fishing boats, a washing and cleaning room, sharp freezers where the fish are quickly frozen hard, a dipping tank for glazing the frozen fish and storage space where about 2,500,000 lbs. of fish can be held in a frozen condition. Many varieties of fish are frozen and stored in this building, including salmon, halibut, herring, red snapper and cod.

Airplane view of Bell Street Terminal at the left and Lenora Street Pier to the right, with the business district in the background

The ice making plant supplies ice to the fishing boats so that the fish can be packed in ice as soon as caught and kept chilled until the boat reaches the freezing plant. Ice is also supplied to refrigerated cars in which fish is shipped to interior points away from the Coast.

Since Seattle lies in a great timber producing district, it has proved economical to use this material in building the structures of the Port of Seattle. Except for the Bell Street warehouse, the Stacy Street warehouse, the grain elevator and the Spokane Street cold storage plant, the buildings are all of timber construction. The wharves are carried on creosoted fir piles, with timber caps, stringers and decking. The transit sheds are of heavy timber framing, with corrugated iron siding. In the newer buildings the runways are covered with asphalt paving in order to reduce the cost of maintenance and repairs and to increase the speed of operation of the trucks. In general, the type of construction adopted for these terminals has proved economical and quite satisfactory.

In order to reduce the fire hazard and the cost of fire insurance all the buildings of the Port of Seattle are equipped with automatic sprinkler systems and other approved fire fighting apparatus. This has resulted in very low insurance rates.

The quay wharf type of terminal has been used entirely, if the two piers at Smith's Cove and the Lenora Street pier are considered as two wharves placed back to back. In every case there is, on the water side, an open apron provided with one or more railroad tracks. For single ship length berths one track is ordinarily sufficient with a width of apron of about 20 feet. For a two

ship length berth or longer two tracks are required on an apron about 28 feet wide, the tracks being connected by crossovers not farther apart than the length of a ship.

The transit sheds are largely twos tories in height and vary in width from 70 feet to 118 feet. The wider sheds are better adapted to economical operation under present day conditions. All two-story sheds are provided with one or more large freight elevators. The platforms of the elevators are long enough to allow one tractor truck and two or three trailer trucks to be elevated or lowered at a time.

In order to facilitate the handling of cargo between the ship and the second story of the transit sheds movable platforms are provided which can be travelled along the open apron spanning the railroad tracks.

Back of each transit shed there are provided two or more railroad tracks, depressed so that the floor of the railroad car is flush with the floor of the transit shed. In most cases the tracks are paved so that motor cars can back up to certain transit shed doors and receive or discharge freight without entering the sheds.

The warehouses in general are located parallel to the transit sheds and separated from them by the depressed tracks. Bridges over the tracks at the second floor level allow direct connection between transit shed and warehouse

The ordinary movement of freight between ship's tackle and point of rest in the transit shed is by means of four-wheel trucks towed in trains of from two to four by gasoline driven tractor trucks. In handling cargo in cases or boxes sling boards the size of the truck bed are used. A loaded sling board is lowered by the ship's tackle directly on the truck and an empty sling board returned from another truck to the hold of the ship to be loaded. For a large part of the cargo handled at this port this proves to be a very economical system. Power driven stackers and pilers are used where high piling is necessary. Trains of gravity rolls are also very often found convenient in handling certain classes of freight from railroad cars and the transit shed.

Two steam driven locomotive cranes are kept ready to handle heavy lifts and are also used in the repair and maintenance work. On Pier 40 there is a shear leg derrick with a lifting capacity of 100 tons. It is so situated that it can transfer heavy lifts between ship and freight car.

Ship repair facilities at the port are adequate A floating drydock is located on Harbor Island on the south side of Elliott Bay, capable of lifting vessels up to 15,000 tons. At that point there are also shops well equipped to handle any kind of ship repair work. Many other repair shops are located around the harbor for doing specialized work.

Summarizing, the port of Seattle is equipped to handle expeditiously and cheaply the ships that frequent the port and to facilitate the transfer, storage and forwarding of cargo. The terminals are well planned, the buildings substantial and convenient, the fire protection features well cared for and adequate and modern freight handling equipment is available.

The German "Zeppelin on Rails"

(Continued from page 254).

toilet and washroom. The seats are arranged as in an American Pullman chair car, although it would be possible to arrange seats as in a motor bus, in which case 40 to 50 passengers could be accommodated. Plate-glass windows run the full length of the compartments, so that the view is unobstructed.

No prediction can be made as to how effective this new type of fast transportation will be or when it may be introduced, and for the moment it may be considered only as an interesting novelty with possibilities for future limited application.